Mining CONGRESS JOURNAL

AMC

MARCH 19[illegible]

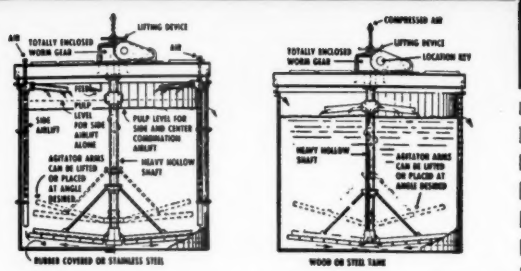
DENVER AGITATORS are STANDARD for LEACHING

Stainless steel tanks for Denver Agitators made in Canada enroute to Sherritt Gordon Mines Limited.

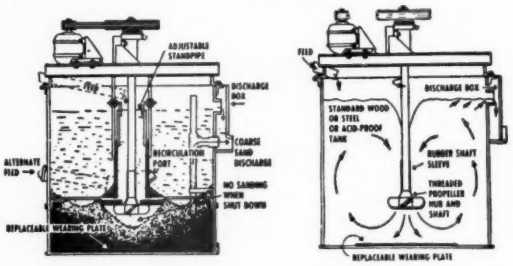
SHERRITT GORDON MINES, LTD. USES 28 DENVER AGITATORS

Sherritt Gordon uses 2 propeller type and 4 rake type DENVER Agitators at their Lynn Lake Concentrator and 16 propeller type and 6 rake type DENVER Agitators at their Fort Saskatchewan Refinery.

ALSO—There are 24 No. 30 (56 x 56) and 112 No. 24 (43 x 43) DENVER "Sub-A" Flotation Cells at Lynn Lake Concentrator producing nickel and copper concentrates.



Denver Side and Center Air-Lift Agitators showing method of pulp recirculation. Note many features that give trouble-free operation.



Denver propeller type agitators meet many needs for conditioning, scrubbing or leaching. Threaded propeller hub and shaft make replacement quick and low-cost.

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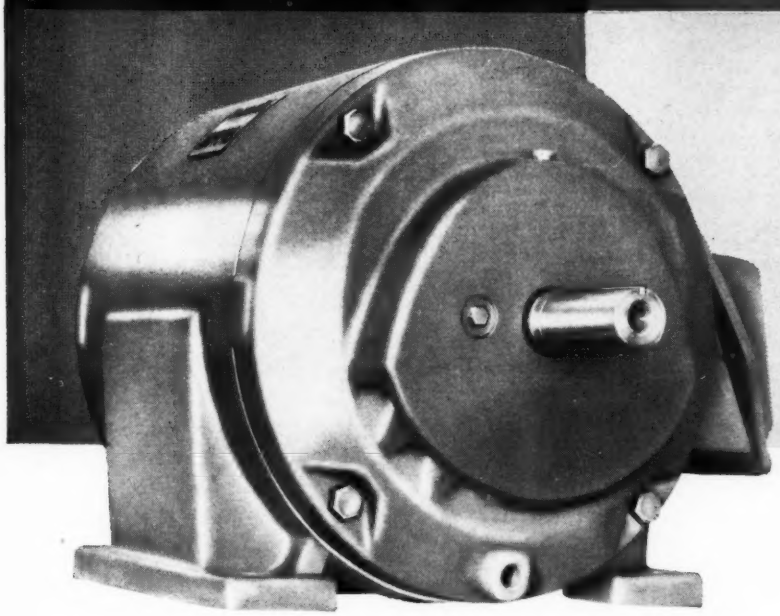

FROM CORE TO COVER

RELIANCE *Totally-Protected* MOTORS

The total protection concept of design and construction armors Reliance A-c. Motors against everyday hazards, with little or no maintenance. Total protection is made up of extra features like:

Slot cell insulation of Double Backed Mylar

Dynamically balanced rotor for vibrationless operation

Entire insulation system impervious to acids, moisture and oils

Metering plate regulates grease flow to bearing

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There are 100 of these extra core to cover protection features in Reliance Motors. Each point is covered in our bulletin, "Check the 100 Facts". Why don't you write for one and get all the details? B-1810

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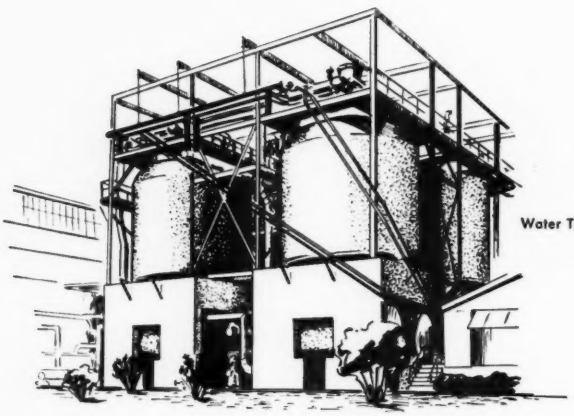

Water Treating Plant

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for Industrial Use

from the properties of

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Producing Units

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PATENTED

blows air . . . not money!

Only a fan engineer can recommend the right type and size ventilation unit for a particular mine operation. The wrong fan can be inefficient, wasteful and costly . . . can literally blow money right out the "stack". The right fan will perform as predicted . . . may reduce power expenditure in just a few years equal to the fan's initial cost.

Continuing confidence in Jeffrey fan leadership is proven again and again as additional mines modernize with new ventilation units. Only a quality product backed by wide engineering and manufacturing experience inspires such confidence.

Since 1907, Jeffrey has sold more than 10,000 fans and blowers of all types for mine use. Hundreds of these, beginning in 1936, have been powerful, efficient AERODYNES like the one shown here.

Jeffrey consultation on ventilation problems is always available at no obligation. Before you buy *any* fan . . . new or used . . . see Jeffrey.

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FOR MEDIUM DUTY . . . the economical 6F Series and the low cost AERODYNE Jr.

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Write to Mining Sales Division, The Jeffrey Manufacturing Co., Columbus 16, Ohio. District Offices in Beckley, Birmingham, Chicago, Denver, Pittsburgh, Harlan, Salt Lake City.

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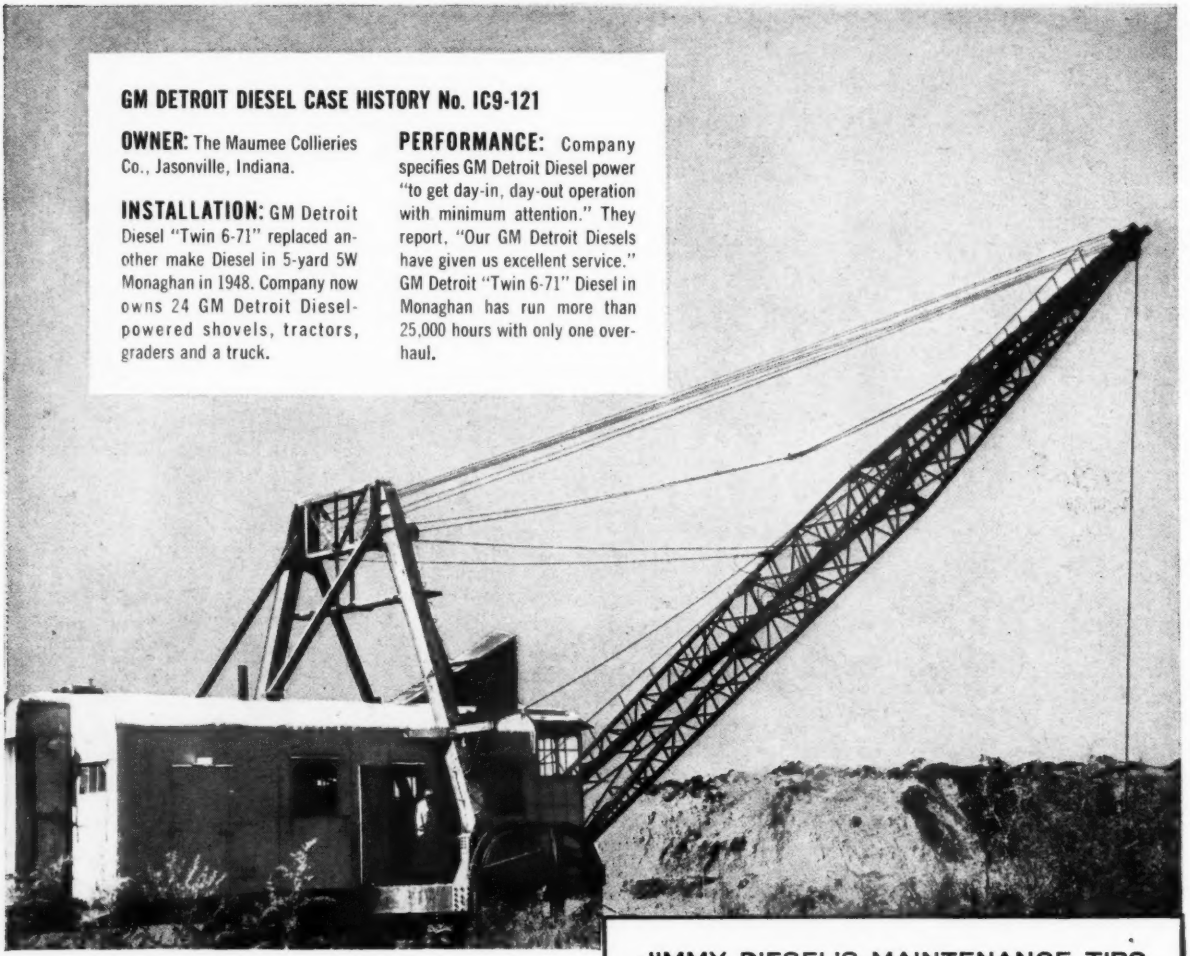
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

"ON THE JOB DAY-IN AND DAY-OUT"



GM DETROIT DIESEL CASE HISTORY No. IC9-121

OWNER: The Maumee Collieries Co., Jasonville, Indiana.

INSTALLATION: GM Detroit Diesel "Twin 6-71" replaced another make Diesel in 5-yard 5W Monaghan in 1948. Company now owns 24 GM Detroit Diesel-powered shovels, tractors, graders and a truck.

PERFORMANCE: Company specifies GM Detroit Diesel power "to get day-in, day-out operation with minimum attention." They report, "Our GM Detroit Diesels have given us excellent service." GM Detroit "Twin 6-71" Diesel in Monaghan has run more than 25,000 hours with only one overhaul.

THE STORY of the Maumee Collieries is duplicated thousands of times.

A customer gets his first General Motors Detroit Diesel. And it quickly establishes a fast-working, cost-cutting reputation.

Then he buys another—and another—until soon he's standardized on GM Detroit Diesel power.

For a GM Detroit Diesel is packed with real snap that makes the job go faster—sets the pace for your whole operation. And after you see what this Diesel can do, you'll be satisfied with no other Diesel.

The reasons are simple. Two-cycle operation. Easy maintenance. Simple repairs. Low-cost, interchangeable parts and fast service everywhere.

These are just a few reasons why it's *America's first choice Diesel*. Your local GM Detroit Diesel distributor can tell you the full story or write direct.

JIMMY DIESEL'S MAINTENANCE TIPS

Got Spring Fever? Maybe your engines have, too. Your GM Detroit Diesel distributor or dealer can snap 'em out of it with a spring tune-up. And he'll help you set up a preventive maintenance program to keep your engines running right all summer long. Take care of your engines and they'll take care of you and remember—Preventive Maintenance Doesn't Cost—It Pays.

Jimmy Diesel

DETROIT DIESEL

Engine Division
of General Motors
Detroit 28, Michigan

Single Engines . . . 30 to 300 H.P. *Multiple Units . . . Up to 893 H.P.*

America's Largest Builder of Diesel Engines

MARCH, 1956

VOLUME 42 ● NUMBER 3

Mining

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Circulation
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Published Monthly. Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign $5.00. Single copies, $0.30. February Annual Review Issue, $1.25. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.

Indexed regularly by Engineering Index, Inc.

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IN OHIO . . . AND THE WORLD OVER

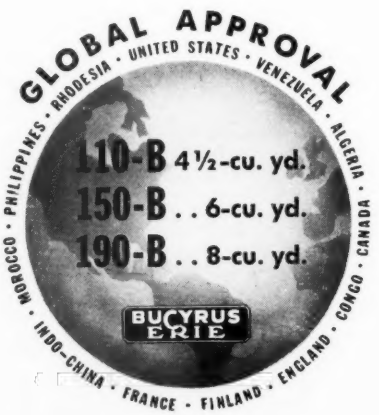
Coal Men Look to Bucyrus-Eries for Real Cost-Cutting Performance

Equipped with special 7½-cu. yd. dipper, this 150-B shovel loads coal from pit near Lexington, Ohio. A 45-cu. yd. Bucyrus-Erie 1050-B shovel is used here, too, for stripping overburden.

With Bucyrus-Erie shovels, like the Model 150-B shown here, experienced mine operators are cutting costs today right where they begin — in the pits. These heavy-duty excavators, because of their advanced design and construction, offer performance that means high output at low cost per yard.

Front-end design is a good example of how Bucyrus-Erie builds better performance into shovels. The unique, two-piece boom is exceptionally strong, rigidly braced to the A-frame with steel members, and has widespread boom feet. It takes digging stresses from all directions. Yet, with all its strength, its weight is light. Crowd machinery is on the revolving frame — not on the boom. Power is applied to swinging profit-making payload, not moving dead weight.

Let experience be your guide when choosing your next loading shovel — the experience of satisfied owners who have found Bucyrus-Erie Ward Leonard electric excavators give them the big output, low cost performance they need. 45L55



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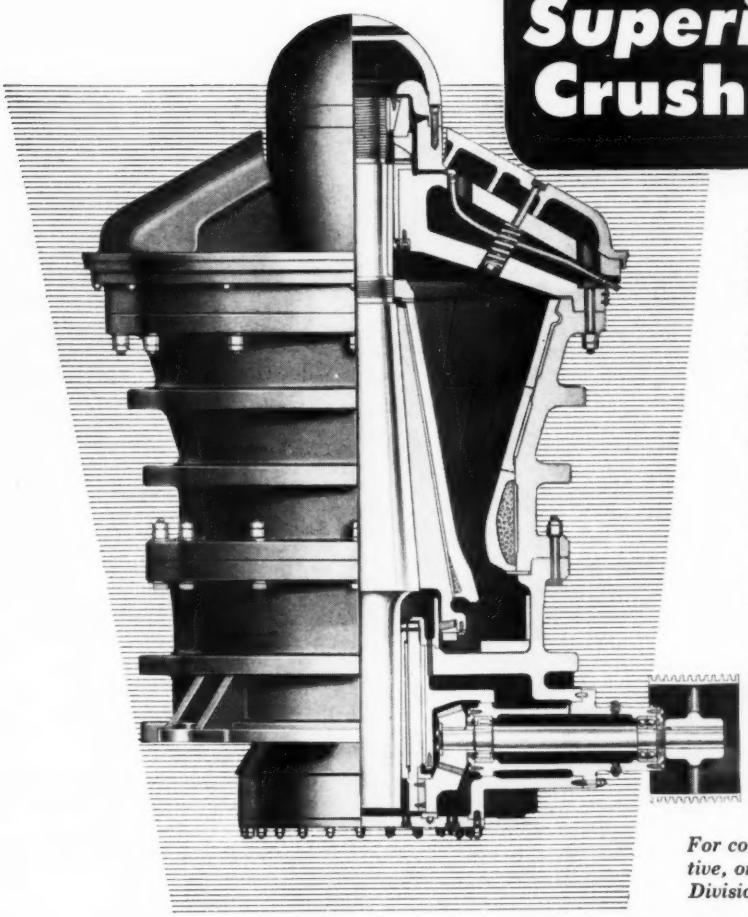
South Milwaukee Wisconsin

75 YEARS OF SERVICE to Men Who Shape the Earth

Only one crusher gives you

Complete Adaptability for a BALANCED CIRCUIT

Superior Crusher



• With a *Superior* gyratory crusher pacing production, your entire circuit remains in balance. Subsequent equipment—crushers, screens, grinding mills—need not be readjusted to varied product sizes and capacities. The many variable factors provided by the *Superior* crusher permit obtaining the kind of production flow demanded by your other equipment. For example, changing eccentric throws, crusher speed or shape of crushing chamber varies capacity and product size. The *bottom discharge* permits utilizing the concrete foundation as a surge bin to control flow of material through your plant.

Hydroset control is another factor in maintaining a balanced circuit. Retaining the initial crusher setting by compensating for wear is a one-man, one-minute operation when a *Superior* gyratory crusher is so equipped. Emergency unloading is made easier with just the flick of a switch. A-4934

For complete information, see your A-C representative, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis., for Bulletin 07B7870.

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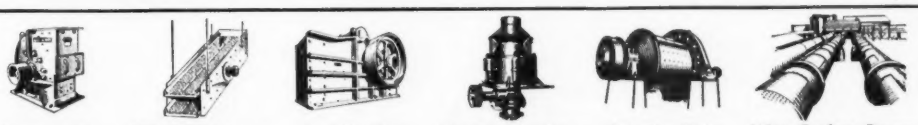


Hammermills | Vibrating Screens | Jaw Crushers | Gyratory Crushers | Grinding Mills | Kilns, Coolers, Dryers

Now-Du Pont Offers Two New Blasting Agents for Overburden Shooting

Seven reasons why new Du Pont "Nitramite" and Du Pont Akremite* will meet your blasting needs

	DU PONT "NITRAMITE"	DU PONT AKREMITE*
AVAILABILITY *Large diameters only*	Manufactured and sold throughout the country in a wide variety of sizes.	Can be manufactured and used under sublicensing arrangement from licensed manufacturers or purchased for use from said manufacturers.*
ECONOMY	Popular combination of high strength and low cost.	Lowest-cost blasting agent developed to date.
VERSATILITY	Excellent blasting action in both hard and soft materials and either vertical or horizontal holes.	Proven performance in bituminous-coal strip pits. Potential application in wide variety of bank shooting.
WATER RESISTANCE	Good water resistance—can be loaded in water if shot within eight hours.	Recommended for loading in substantially dry holes. Package is moisture-resistant.
SAFETY	Cannot be accidentally detonated by shock, friction, rifle bullets, "Primacord," or a blasting cap. Should be primed with a special insensitive "Nitramite" Primer, which must be initiated with "Primacord."	Cannot be accidentally detonated by shock, friction, rifle bullets, "Primacord," or a blasting cap. May be primed with dynamite in standard wrappers or flexible plastic bags, or for maximum safety, "Nitramite" Primers.
CONVENIENCE	Furnished in a substantial container that is easy to handle and load—even in usually troublesome horizontal holes.	Packaged in a flexible plastic bag that loads easily and conforms to shape of borehole.
NO HEADACHES	Contains no Nitroglycerin and cannot produce "powder" headaches.	Contains no Nitroglycerin and cannot produce "powder" headaches.

E. I. du Pont de Nemours & Co. (Inc.),
Wilmington 98, Delaware

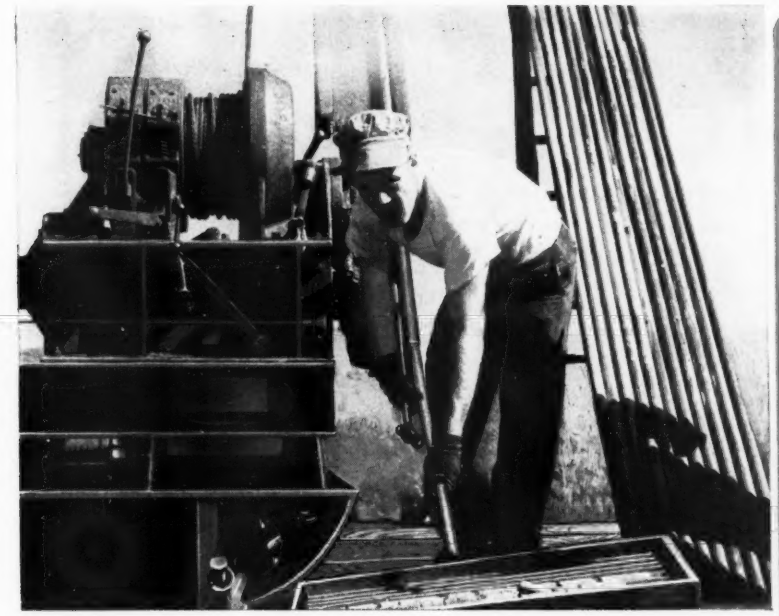
**Licensed exclusively to the Du Pont Company under the Maumee Collieries Company Process Patent No. 2,703,528.*

DU PONT BLASTING AGENTS

Blasting Supplies and Accessories

DU PONT

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*



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SINCE 1883

Founded more than seventy years ago, in the heart of the then rapidly-expanding anthracite industry, Sprague & Henwood, Inc. pioneered many important developments in Diamond Core Drilling that have stood the test of time.

During this long period of successful operation our crews have completed thousands of drilling contracts, in all parts of the United States and in many other countries. Satisfactory results were secured in some cases where other drillers failed, through the use of special equipment designed by our experienced excutives and built in our own extensive shops.

Today, we have a large force of expert operators and an ample supply of modern equipment, so that we can undertake practically any job, anywhere, on short notice. Inquiries for all types of contract drilling work are solicited — estimates submitted promptly without charge or obligation.

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NEW LIGHT-WEIGHT HIGH-SPEED CORE DRILLING MACHINES
Model 30 and Model L-2

Supplementing our well-known line of heavy-duty machines for large-diameter and deep-hole drilling we now offer two light-weight high-speed core drilling machines suitable for either Skid, Trailer or Truck mounting. Both models can be powered by either gasoline or diesel engines and air or electric motors. Easily moved from one location to another, they can also be relied upon to produce good smooth cores rapidly at minimum expense.

Standard single-pole derrick permits pulling rods or casing up to 10-ft. lengths

Modern simplified design includes convenient controls, machine-cut alloy-steel gears, anti-friction bearings and other improved features to assure low-cost trouble-free operation. Write for illustrated leaflets containing complete descriptions and working data.

Model 30, Truck Mounted

Complete drilling rigs, mounted on 4-wheel-drive trucks with capacity for carrying accessory equipment and supplies.

Model 30
Trailer Mounted

for easy portability without tying up a truck.

Model 30
Skid Mounted

for jobs not easily accessible by truck or trailer. Wide structural-steel base and low center of gravity provide ample stability.

Leading Manufacturers of High-Speed Diamond Core Drilling Machines, "Oriented" Diamond Bits and a complete line of Improved Accessory Equipment for Core Drilling and Soil Sampling. Write for illustrated catalogues containing complete specifications and all necessary working data on:

Auger Bits, all types
Bails, lifting
Ball-Bearing Waterswivels
Bits, Diamond
Bits, Blank
Bits, Chopping
Bushings, Rod & Casing
Casing, Flush Coupled
Casing Tape
Clinometers

Corebarrels, all types
Corebarrel Tops
Core Lifters
Couplings, Rod
Derrick Sheaves
Drill Rods
Drilling Machines
Drive Hammers
Drive Heads
Drive Pipe

Drive Pipe Couplings
Drive Shoes
Extensions, Core Barrel
Fishing Tools
Fishtail Bits
Flush Coupled Casing
Foot Safety Clamps
Hoisting Hooks
Hoisting Plugs
Hoisting Plug Reducers

Hoisting Rings
Hose, Waterswivel
Hose, Suction
Jar Lengths
Jaws, Safety Clamp
Lifters, Rod
Mud Bits
Pilot Reamers
Plugs, Hoisting

Pressure Testers
Protectors, Casing
Reamer Shells
Reducers, Rod
Rods, Drill
Rod Couplings
Rod Taps
Rose Bits
Safety Clamps

Sawtooth Bits
Sheave Wheels
Soil Samplers
Subs
Taps, Fishing
Testers, Sample
Testers, Pressure
Wash Plugs
Water Swivels

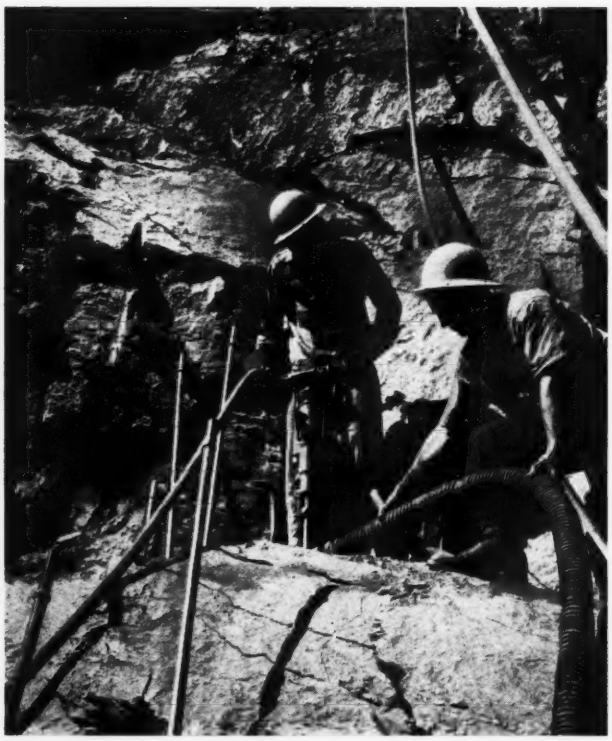
how to get the most out of HOLLOW DRILL RODS

The present trend in mining is toward smaller drill holes which require the use of smaller bits and, consequently, smaller hollow drill rod sizes. And that's increased the use of *alloy* steels such as Crucible CA DOUBLE DIAMOND and 4E Hollow Drill Rods.

These new alloy rods have proved themselves on many jobs by lengthening rod life, cutting drilling costs. But they are not unmixed blessings, for they will give a good account of themselves only if they are handled properly. Hammer and tongs blacksmithing isn't enough. Alloy rods demand greater care in forging, upsetting and heat-treating.

Should You Use Carbon or Alloy Rods?

There's no one answer to that question, unless it is *use the rod that best fits the individual job.* Generally, air-feed jackhammers and other small, light drills benefit from the use of alloy drill rods. For alloy rods have greater resistance to fatigue, higher elastic limits – important where smaller rod sizes are used.



Rod Stiffness . . .

Rigidity or stiffness can only be increased by enlarging the cross section of the rod. If you decrease the cross section you'll get more whipping no matter what type steel you use, or how you heat treat it. Therefore, don't use a ⅞" hexagon alloy rod when you've been using a 1¼" round carbon rod, unless an increase in flexing and less stiffness is unimportant.

Abrasion Resistance . . .

The higher the hardness the better a drill rod will stand abrasive wear. Alloy rods have the advantage in this respect, for they can be heat-treated to higher hardnesses than can carbon rods.

Notch Effect . . .

Notch effects caused by failure to overlap heats in treating shanks, or those caused by careless handling, chain marks or corrosion pits all cause rod failure. Alloy rods are more resistant to these nicks or notches than carbon steels, but when they do occur failure can be more rapid.

The answer to better drilling is simply this: choose the right drill rod, and then give it reasonable and proper care.

And for the *right* carbon or alloy hollow drill rods – in the sizes, shapes, and grades you need – Crucible is the place to go. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

You get your money's worth
when you buy O-B shells and plugs!

You buy more than high-strength anchors when you buy O-B shells and plugs for roof support!

You buy a fast bolting cycle, too, because these O-B units are easy to work with. They go on the bolt fast—no delays due to off-size threads. • They go up the hole fast—no hanging up half-way. • They tighten up fast—no falling out of the hole before tightening, no slipping or spinning in the hole during tightening. • They hold fast—four-way expansion of shell creates a powerful "socket" anchorage that's solidly backed up with heavy metal of the plug.

If you want a high-strength anchor and a fast bolting cycle, too, try these O-B shells and plugs now.

Ohio Brass

MANSFIELD OHIO, U. S. A.

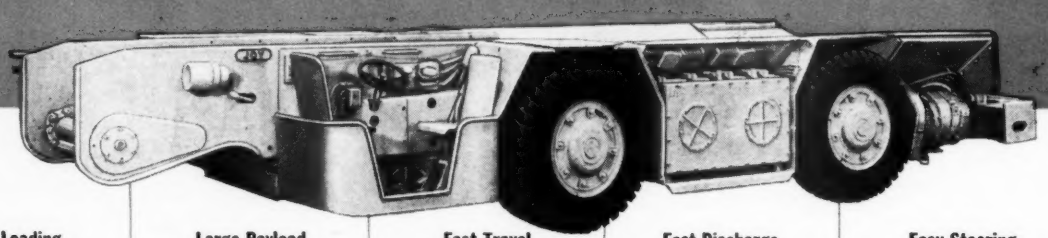
4593-M

Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

BAIL TYPE
5/8" 22463
3/4" 22378

STANDARD
5/8" 21890
3/4" 21889

There's a Valuable Combination



Fast Loading

Sides and ends of the specially designed 9-SC body are just right for easy positioning behind loader boom or surge car. Two-speed, resistance-free operation of motors makes loading easy and fast.

Large Payload

The job-engineered 9-SC packs up to 8 tons of coal per trip. Its rugged body rides on axles, wheels and tires all rated well within load requirements. It is built right to carry big loads dependably.

Fast Travel

Tramming a full load at 3.6 mph, then returning empty at over 4 mph, the Joy 9-SC with 10 HP motors keeps your coal on the move. No time lost due to skidding, tangled cable, burned out resistors, etc.

Fast Discharge

The 9-SC, with hydraulic adjustable discharge, gets rid of a full load in less than a minute. Powerful motors and specially designed, heavy-duty conveyor chain and flights make sure loads continue to empty fast.

Easy Steering

Joy pioneered power steering underground, long before autos had it. The 9-SC now has power-boosted steering that's better and easier than ever. Mechanical steering system is provided, just in case it's needed.

Simple Control

Easy-to-reach controls operate the 9-SC through Joy's positive, trouble-free Magnetax Control. You steer with a familiar wheel from a comfortable seat; brake with your right foot; tram with your left.

Positive Braking

Big airplane-type, hydraulic disc brakes control all four wheels and stay effective, smooth and easy despite coal dust, oil and water. No need to adjust; can be relined in just a few minutes with ordinary tools.

Proved Performance

Nearly 20 years ago, Joy introduced the world's first shuttle car. The 9-SC is one of the most successful in the line, consistently doing a good, dependable job and setting new records in many mines.

Low Maintenance

Basically a modified version of the field-proved 10-SC, the improvements in the 9-SC give you even greater assurance of *continued* service without breakdowns . . . keep it on the go, and maintenance low.

Less Hauling Cost

The 9-SC is a performance-proved car, not a "drawing-board dream" or a test unit. It's ready to work immediately, and many mines have already reported operating costs of much less than 2c a ton.

# of Haulage Advantages for you in the JOY 9-SC SHUTTLE CAR

THE JOY 9-SC Shuttle Car is an ideal unit for the operator who wants high-production haulage at lower first cost—or for use in mines where the service conditions may not be tough enough to require the extra ruggedness of the popular JOY 10-SC.

In the 9-SC, you get a permissible unit that offers many of the best features of the heavier 10-SC, at considerably less cost. The 9-SC Shuttle Car handles payloads up to 8 tons, trams loaded at 3.6 mph, and discharges in 40 to 45 seconds. It is 7′8″ wide and available in 43½″ or 49½″ basic heights—with 4″, 6″ or 8″ sideboards, and 34″, 46″ or 58″ discharge lengths for 250V or 500V-DC operation.

Here is a field-proved shuttle car that can tram a full load up or down a 12% grade, turn on the grade without skidding, and handle coal or rock with equal ease. It has simple, familiar controls—the driver steers with a wheel and brakes with his right foot, going or coming back.

As further assurance that the 9-SC was designed for continuous service under tough conditions, it has the same heavy-duty universal wheel drive units with positive drive (no differential) as the model 10-SC . . . the same heavy-duty spur gear reducers and constant velocity universal joints on the traction drive . . . the same rugged, equalized drag link steering (no tie rods)—and many other identical features, both standard and optional.

Check up on the 9-SC for dependable haulage in medium to thick seams. For *any* haulage problem or other underground requirement, JOY Mining Equipment offers you the field-proved way to boost production and reduce costs. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulleti: 41-3

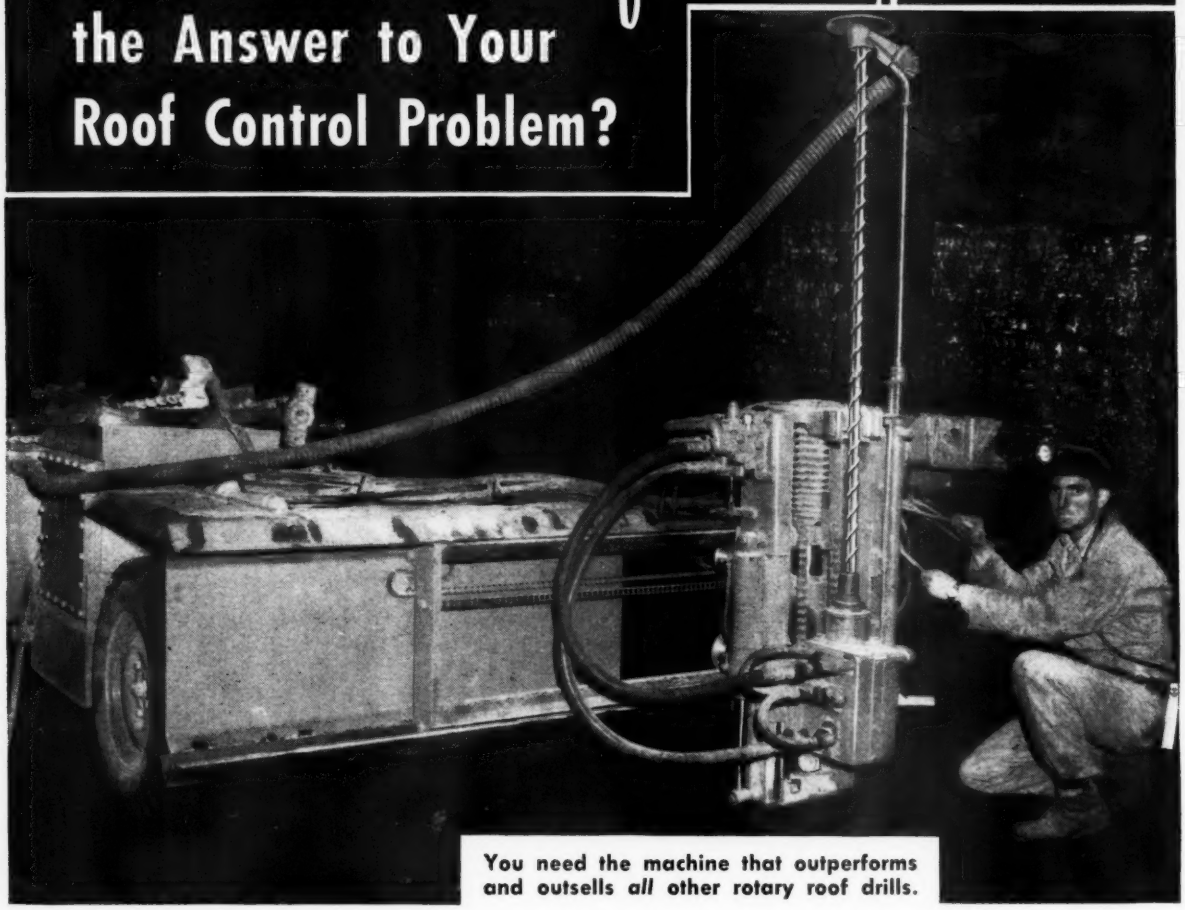
Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

WSW CL5918-41

Is One-Man Roof Bolting the Answer to Your Roof Control Problem?



You need the machine that outperforms and outsells *all* other rotary roof drills.

Hundreds of high capacity FLETCHER Roof Control Drills are keeping well ahead of the machine cycle in mines throughout the country—*in many cases with a single operator!* With their convenient grouping of controls; long, fast strokes in varying seam heights; compact, easily trammed frame and all-hydraulic positioning, these FLETCHER machines will actually deliver two-man results with one-man operation.

In a midwest mine 120 bolts per shift is the average one-man installation rate! Over 230 bolts per shift have been installed with two men on a double section! *What is the bolting capacity of your present equipment?*

Shift-after-shift, FLETCHER Drills deliver more bolts at lower cost than any other drill on the market. That's why almost all mines, sooner or later, standardize on FLETCHER Roof Control Drills. Write for details.

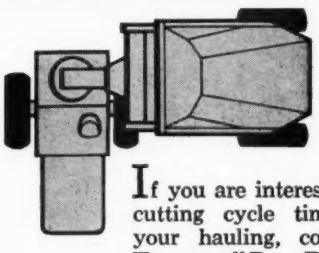
Fletcher
ROOF CONTROL DRILLS

J. H. FLETCHER & COMPANY | P. O. Box 353, HUNTINGTON 8, WEST VIRGINIA
Phone 44186

90° turns . . .

give faster cycles and easier spotting

Tournapull Rear-Dump's short-turn radius saved construction of expensive turn-arounds in this 26' wide, 165' deep railroad cut. With body raised, as shown, "C" easily made non-stop U-turns within the narrow area.



If you are interested in cutting cycle time on your hauling, consider Tournapull Rear-Dumps.

These units make a non-stop U-turn by power steer in less than their own length. They eliminate time normally wasted shuttling back and forth to turn in narrow quarters. They also frequently eliminate skid-plates or expense involved in construction of special turn-around areas.

Where space is unlimited, 90° turnability still gives you faster cycles. At the shovel, fast-maneuvering Tournapull Rear-Dump swings in and positions quickly. Loading unit need not sit idle while hauler operator wastes time on a wide sweeping turn and then a long, slow back-in. Quick, safe spotting saves additional time on the dump.

Simplicity reduces maintenance

A great deal of the expense involved in maintenance is also eliminated because of the simplicity of the Tournapull turn mechanism. Steering involves only an electric motor connected to a ring gear and kingpin shaft. A flick of the finger activates the motor and causes prime-mover to pivot up to 90° around trailing unit. Turns are made quickly regardless of footing. There are no front steering knuckles, no reach rods, no complicated mechanisms to get out of line, maintain, or repair.

Now available with optional tailgate.

Check these and all the other advantages of Tournapull Rear-Dumps. See for yourself how they speed cycles and cut costs. Write or call any time for owner-verified production studies and specifications. There's no obligation.

Model	Capacity	HP	Overall Length	Width req'd, non-stop 180° turn	
				Travel position	Dump position
D	11 tons	138	25'2"	24'8"	19'2"
C	22 tons	208	30'	28'8"	20'8"
B	35 tons	293	37'3"	35'	27'

These features, too, can help on your job

Hauls anywhere — Big single low-pressure tires let Rear-Dumps safely travel narrow haul roads, paved highways, city streets . . . haul cross-country over roughest terrain, through muck and soft fills.

Reduces maintenance — Because these Rear-Dumps have no jack lines, no long drive-shaft, no frame, subframe, springs or tie rods, most common troubles of conventional rear-dump haulers are eliminated.

Dumps fast, clean — Flick of switch activates hoist motor. Body lifts quickly to any desired angle for spreading on run. At full dump position, bowl-lip is behind rear wheels so dump can be made clean over bank. Streamlined body sheds material readily.

Cuts weather delays — Power-transfer differential automatically applies power to drive wheel on firmest footing . . . pulls unit through mud, sand, soft materials which stop ordinary haulers. It's a Tournapull exclusive.

Resists body shock, damage — Three-layer, all-steel, grid-type bowl with tool-steel floor resists loading shocks. Big, wide bowl opening is easy target for any loading unit.

Improves safety — Multi-disc air brakes have more braking surface on one wheel than most haulers have on all 4. Low center of gravity, good visibility, front-wheel drive, easy control all contribute to maximum safety.

Delivers full power — Torque converter (optional in C size) automatically balances load and torque so you get full horsepower always. Lugging is reduced; shocks in transmission and final drive virtually eliminated.

Reduces fatigue — Big low-pressure tires and air-foam cushion seat smooth out ride for operator. Electric push-buttons control power steer and 2-way power dump. Eliminated is all manual work of fighting balky levers.

Insures future earnings — Behind Tournapull prime-mover, you can interchange rear-dump with scraper, bottom-dump, crane, flatbed. These trailing units lower your investment, let you handle any future job efficiently, help you keep your Tournapull profitably busy the year-around.

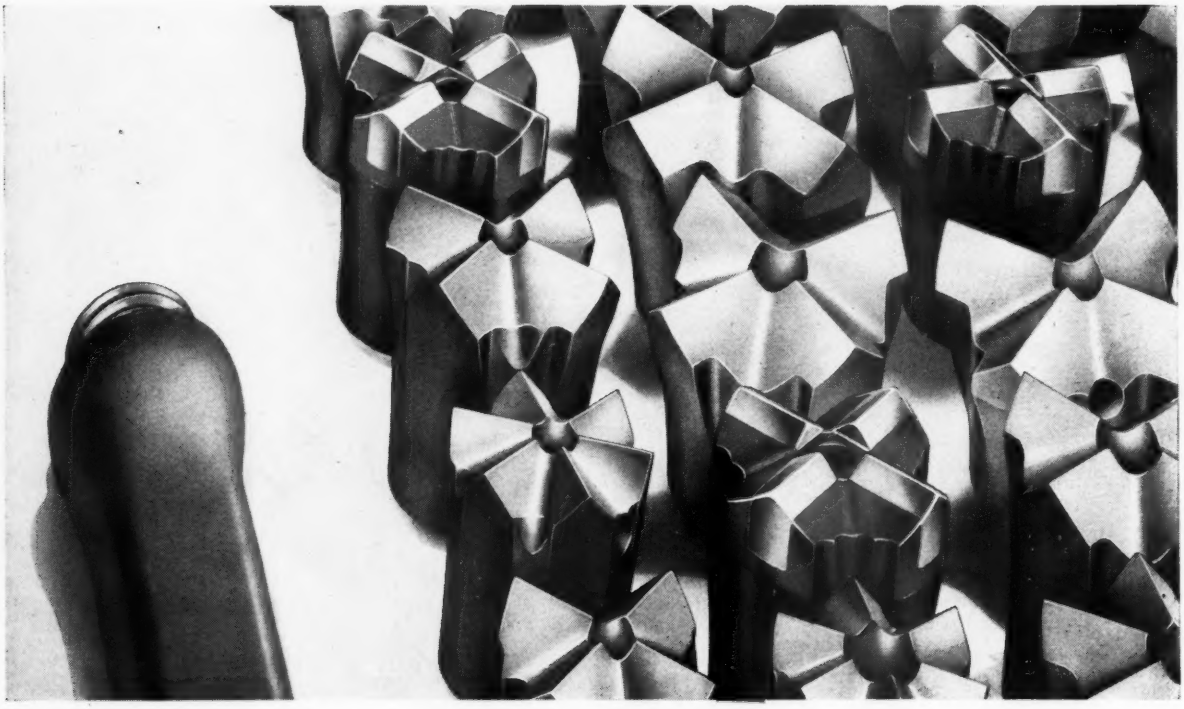
Tournapull—Trademark Reg. U.S. Pat. Off. R-792-G-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

SAVE DRILLING TIME— CUT STEEL INVENTORY



TIMKEN® interchangeable rock bits let you switch bit types without switching drill steels

YOU can save valuable drilling time when changing ground calls for a change in bit type. Dozens of different Timken® rock bits—multi-use and carbide insert—fit the same drill steel . . . can be changed quickly and easily, right on the job . . . with no need to change drill steel. Simply screw one type off, screw the other right on the same drill steel. It takes but a minute.

This way your drillers will put more time into actual drilling. No time wasted changing steels when drilling conditions change. Production will go up, costs down. And with Timken rock bits there's no need to stock expensive double inventories of drill steel.

Both types of Timken rock bits—multi-use and carbide insert—give you two important advantages: 1) they are made from electric furnace Timken fine alloy steel. We're the only American rock bit manufacturer that takes this extra quality step. 2) a special shoulder union originated by the Timken Company keeps drilling impacts from damaging the threads.

When you consult Timken rock bit engineers, you get the benefit of over twenty years' experience in solving tough drilling problems. Why not give us a call with your next drilling problem? No obligation, of course. Call or write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct and controlled reconditioning, they give the lowest cost per foot of hole when full increments of steel can be drilled.

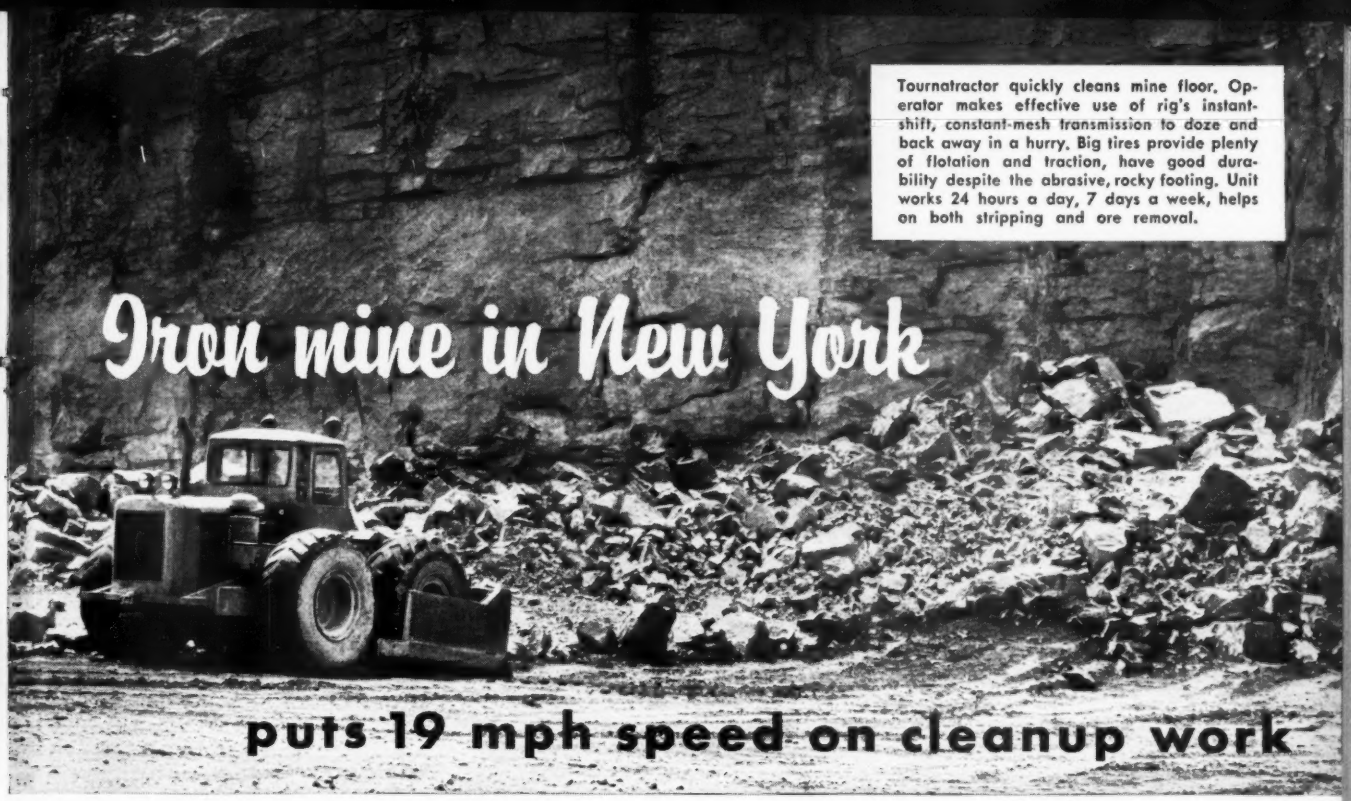
WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hard, abrasive ground. Also most economical for constant gauge holes, small diameter holes, very deep holes.

. . . your best bet for the best bit . . . for every job

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.



Tournatractor quickly cleans mine floor. Operator makes effective use of rig's instant-shift, constant-mesh transmission to doze and back away in a hurry. Big tires provide plenty of flotation and traction, have good durability despite the abrasive, rocky footing. Unit works 24 hours a day, 7 days a week, helps on both stripping and ore removal.

Iron mine in New York puts 19 mph speed on cleanup work

- **Rubber-tired tractor clears pit-floor after blasting**
- **Rig also cleans up around 4½-yd. shovel**
- **In winter, plows snow from haul roads and blast areas**

Open pit operators and contractors have a common problem in handling their cleanup work. In either case it's a need for getting the most in speed and maneuverability. Here's a typical example of how Tournatractor licked this problem for an eastern iron mine.

On the relatively long runs between operating faces, this 19 mph rig makes a much faster trip than could a crawler-tractor. Another advantage of Tournatractor is that it does not cut-up the surface of the haul roads like a crawler does.

During winter, Tournatractor also finds time to plow snow from the pit roads and loading areas. It also clears areas to be blasted. This keeps snow from getting mixed in with the shot rock and later from causing trouble inside the crushers.

"Excellent on night shift"

For work on the night shift, owners are particularly pleased with the lights on their Tournatractor. They find that "night work does not slow this rig nor put any limitations on areas where it can travel or work."

For proof of the advantages, of this high-speed 208 hp machine, ask for a demonstration *on your job*. See for yourself how quickly and economically it handles your scattered assignments for pushing, pulling and dozing.

The ore body being mined here was discovered in 1810 by engineers surveying a military road between Albany and Ogdensburg. Only a small amount of iron was removed, however, until 1944 when modern methods of beneficiating magnetite and low-grade non-magnetic martite ores made the operation profitable. This year, 1,300,000 gross tons will be processed. All will be taken from a deposit slightly over 2 miles long and 200′ to 1400′ wide. Iron content averages 24%. Overburden includes a structural hanging wall of granetized gneiss, plus up to 60′ of glacial drift (mostly sand, hardpan, and boulders). Height of operating faces is set at 50′ except for some first cuts of 100′. Drilling is made with 42-T and 50-T churn drills, with chrome-nickel-moly bits of 4340 grade. Nine-inch primary holes are spaced about 23′ apart and burden at toe is kept as close to 20′ as possible. Every pound of explosive breaks about 2.35 gross tons of crude ore. This is loaded by 4½-yd. shovels into 22-ton rear-dumps and transported to the 54 inch primary crusher. Rock chunks too big to pass the 4½-yd. dipper (about 1 chunk per 40 tons of crude ore) are reduced to handling size by a 4-ton drop ball handled by a truck crane.

Tournatractor—Trademark T-751-M-b

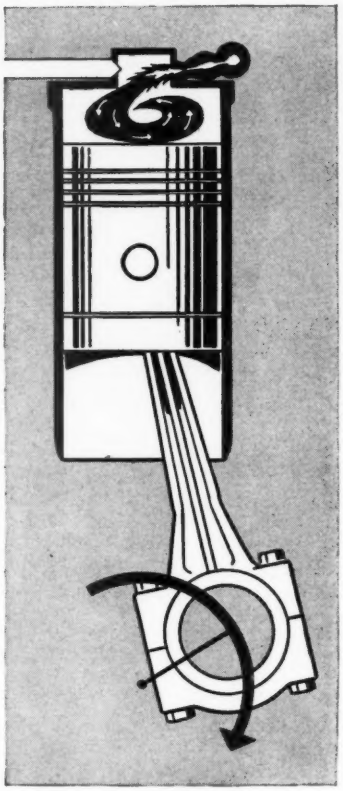
LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

The New Allis-Chalmers Power Unit Line Delivers

LOWER COST POWER

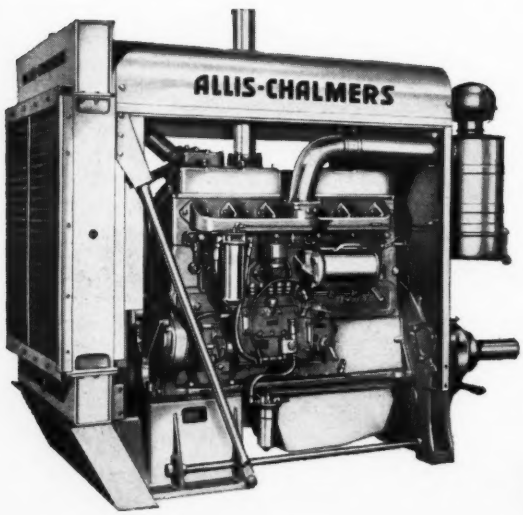


Allis-Chalmers diesel power units provide a new kind of engine performance and extra-long life. Heart of this outstanding performance is a unique *follow-through* combustion. Here's how it works —

A blast from the energy cell (see drawing), thoroughly mixes air and fuel for complete burning in the combustion chamber. This results in peak efficiency, lower cylinder temperatures for more complete lubrication of walls, longer life for pistons and rings.

In addition, Allis-Chalmers power units are designed with seven main bearings, rigid blocks, removable "wet" cylinder sleeves, removable valve guides, full-length water jackets, full-pressure lubrication — all contributing to dependable, continuous, long life performance.

Ask your Allis-Chalmers dealer for the visual story revealing the full advantages of these engines.



Five sizes of Allis-Chalmers diesel power units —ranging from 15 to 197 brake hp—are available as open style or complete self-contained units. They are compact and easily installed on donkeys, saw and planing mills, etc.

Illustrated: Model D-779

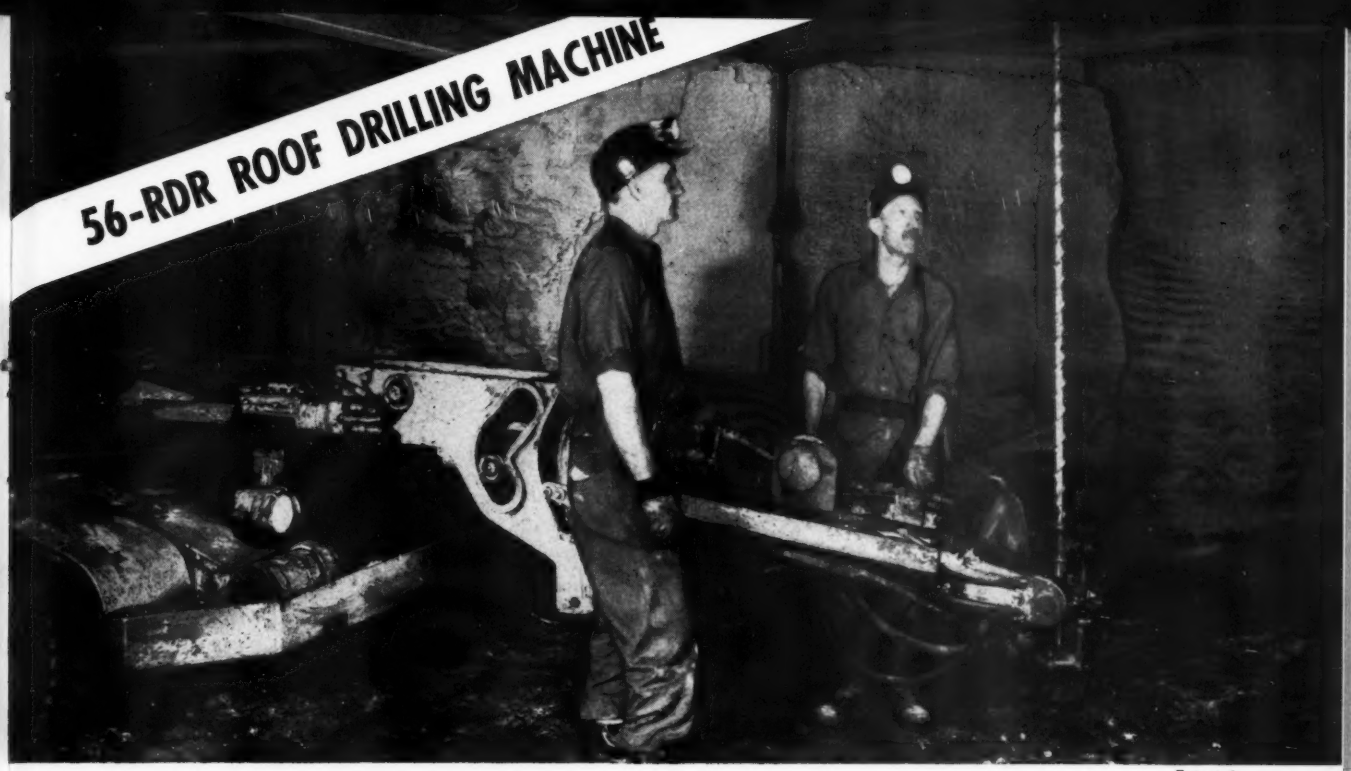
6-cylinder diesel

140 brake hp at 1400 rpm

779 cu in. displacement

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS



Patented

fast full-time roof bolting...

It's a big, rugged, high-capacity machine for round-the-shift work. It trams fast. It can bolt a wide room from one position. The Jeffrey 56-RDR Roof Drilling machine has extra features that pay off in bigger production, lower maintenance.

This unit is especially well adapted to mines demanding a sturdy, stable machine . . . one that is expected to work a normal shift's roof drilling and bolting, plus extra places on some shifts.

Performance, like the following example, field-proves the 56-RDR's excellence: in the Pittsburgh seam, 84″ to 96″ high, a crew of two men with the 56-RDR drilled and bolted 23 working places or 138 holes 5′ deep. Besides, they drilled coal holes for shooting in 19 of these places, 4 holes per place or 76 holes 8′ deep. These were drilled with a hand-held hydraulic drill operated through a power takeoff from the 56-RDR.

Bolts ranged from 4′ to 7′, average being about 5′. Holes were drilled through 6″ to 12″ top coal . . . 1′ drawslate . . . "wild coal" varying in thickness from 2″ or 3″ to 1′ . . . "white rock" strata of clod 1′ to 3′ thick — to find anchorage in a black slate shale above.

Check these features — only three of many on the 56-RDR:

- Drill boom controls are centralized and within easy reach of the operator.
- Size and stability make unit ideal carrier for generous quantities of roof bolt materials and drill supplies.
- Cable reel of superior design pays off in extremely low cable costs over a period of years.

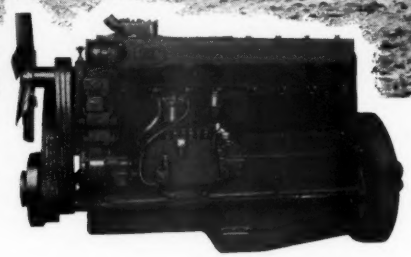
For additional information, write to Mining Sales Division, The Jeffrey Manufacturing Co., Columbus 16, Ohio. District Offices in Beckley, Birmingham, Chicago, Denver, Pittsburgh, Harlan, Salt Lake City.

JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Fast and flexible operation, top picture, is aided by drill arm swing of 10′ 9½″ right or left of center. Wide room can be bolted with minimum truck maneuvering.

Besides supplies, 56-RDR pictured at right carries Jeffrey A9A Hand-Held Hydraulic Drill which operates through a power takeoff for face drilling of powder holes.



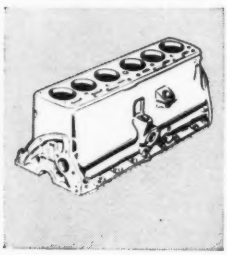
Tough truck service is one of the jobs where Allis-Chalmers engines show their ability to give *extra* satisfaction. This 30-ton truck owned by a large mining company is powered by an Allis-Chalmers 8DAS-1125 supercharged diesel.

Allis-Chalmers Engines are built to give you more . . . *and they do!*

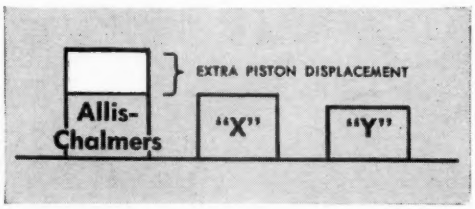
Whether you need but a few horsepower or several hundred; whether you choose diesel, gasoline, natural gas, butane or propane fuel — you can expect to find an Allis-Chalmers engine to best fit your requirements.

But you can expect more — more usable horsepower, with conservative ratings, high average torque — more time on the job because of rugged construction, ease of servicing — more economical operation, with maximum fuel economy, long service life.

Behind these performance and satisfaction "extras" are many design and construction advantages. For instance, there is longer engine life, less maintenance in the Allis-Chalmers strong, rigid, one-piece block.



Many other features also contribute to long engine life, low maintenance costs — extra-strong, forged crankshafts, big rod-bearing area, oversize piston pins, five-ring pistons for best sealing.



There is also great reserve power in Allis-Chalmers big piston displacement. This means higher usable torque in the normal operating range, lighter engine loading, less strain on the engine.

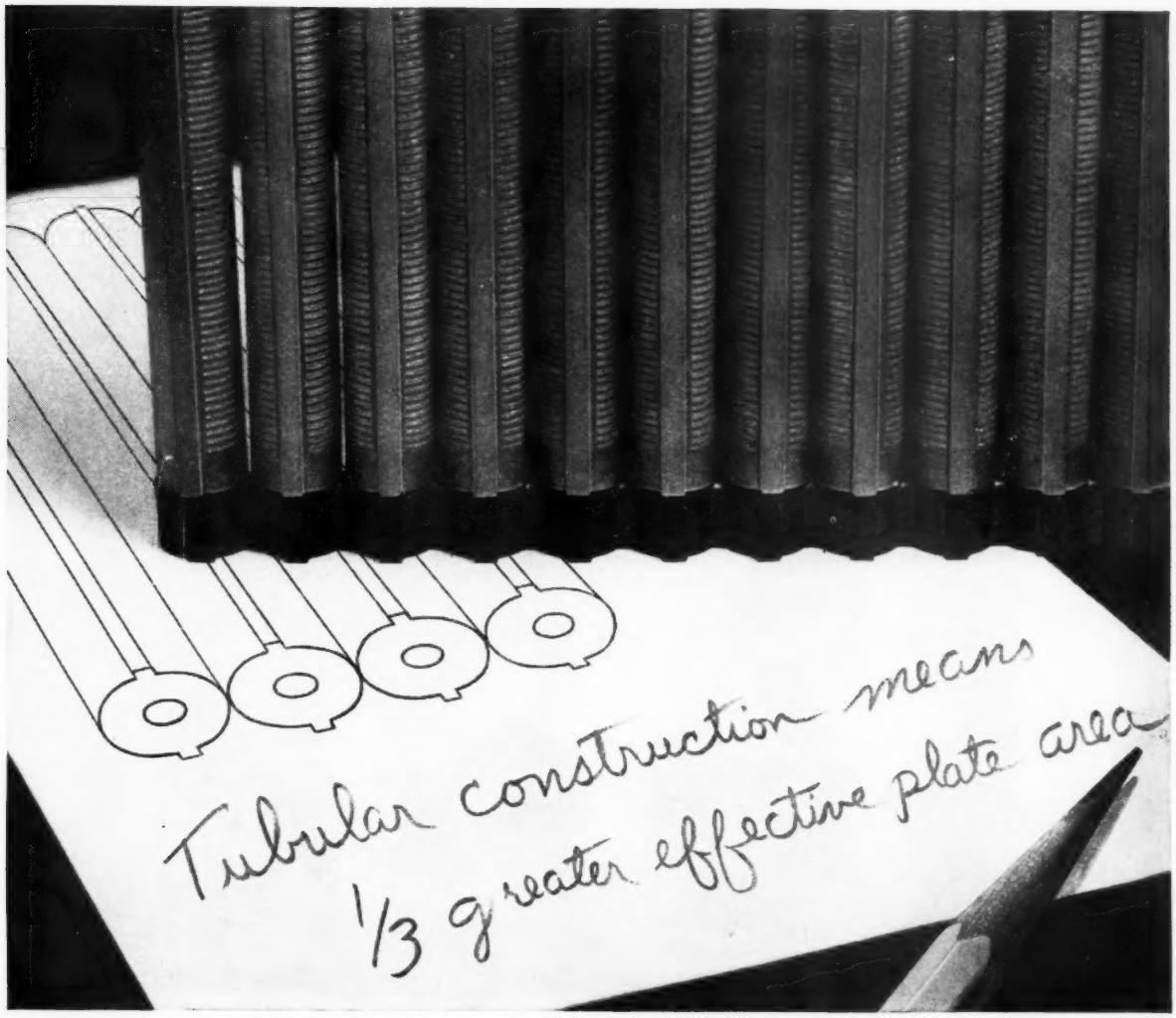
Let your Buda Division, Allis-Chalmers distributor give you the complete story on these economical, dependable engines to fill every power need.

ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

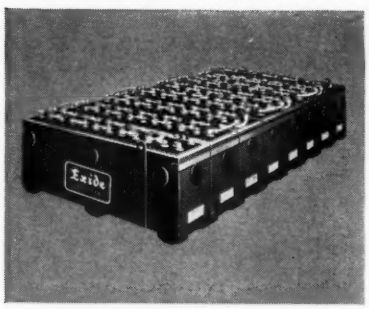
ALLIS-CHALMERS

BC-2A

EXIDE-IRONCLAD BATTERIES



Greater effective plate area boosts power for peak loads



BATTERY FOR MINING LOCOMOTIVE, Model MVM. Specially designed to fit space provided on locomotive. Has tubular construction of positive plates, Silvium grids, "Permanized" negative plates, extra heavy connectors, and all other Exide-Ironclad advantages that mean power to spare in heavy duty applications. Write for Bulletin 5161.

According to general principles of storage battery engineering, power reserve is governed by positive plate area. In the Exide-Ironclad greater effective plate area is achieved without increasing plate size. Here's how:

In the Exide-Ironclad positive plate, active material is held captive in tubes of slotted polyethylene. These tubes are arranged in a tight row with electrical connections only at the top. The actual surface of the plate is the combined semicircular sides of these tubes—the total surface area being roughly one-third more than the projected dimensions of the plate.

In use, this unique design feature means that more active material is exposed to electrolyte for a given size battery. It means the battery can provide power to spare for peak loads as well as a dependable source of continuous power.

Only Exide-Ironclad Batteries have this advantage. Be sure to specify them when you order—for either new equipment or for replacement. Exide Industrial Division, The Electric Storage Battery Company, Phila. 2, Pa.

Exide®

Switch to rotary drilling with Kennametal* Bits cuts drilling time by 75%

improves production cycle . . . lessens fatigue of drillers . . . reduces dust, vibration and noise . . . increases safety

The Problem: Mining anthracite coal in Bottom Red Ash seam, which is from 5 to 6 feet thick with hard bands of bony, slate and sulfur pyrites. Face preparation requires drilling 10 to 12 holes 7 feet deep. Using percussion drills, the drillers worked two tiring hours on each face drilling cycle. Excessive dust, vibration and noise made the whole working area uncomfortable.

Solution: A switch was made to Kennametal DLC-1¾ drill bits and Kennametal twisted Shank Augers on rotary air drills.

Ask about the complete line of KENNAMETAL drill bits, cutter bits, roof bits, augers, pinning rods, accessories

RESULTS:

Drilling time was cut from 2 tough hours to ¼ or ½ hour. One crew drilled a face in the amazing time of 11 minutes. Drillers are less fatigued; and since noise, vibration and dust have been reduced, the whole working area is more comfortable and a safer place to work. The crews are safer, more productive workmen.

Whether it is drilling in problem areas or in clean coal, you will find a Kennametal Drill Bit to do the job fast, with low bit and maintenance cost and long bit service. Ask your Kennametal representative to show you these bits. Try them in your mine. KENNAMETAL INC., Mining Tool Division, Bedford, Penna.

*Registered Trademark

B-5909

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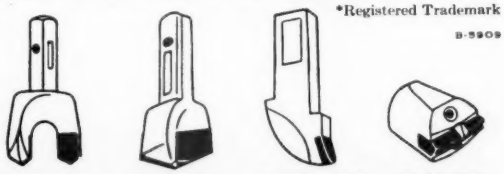
KENNAMETAL
...Partners in Progress



★ Mining CONGRESS JOURNAL ★

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
ROBERT W. VAN EVERA, Editor

Stability for Lead and Zinc

CONSUMERS of lead and zinc have been faced, since World War II, with wide fluctuations in metal prices. For them downward fluctuations are apparently a help, but whether they are aware of it or not, the returning pendulum can readily hit them in the neck.

In the case of zinc, for example, drastically low prices due to heavy post-Korea imports brought about the liquidation of some 150,000 tons of annual production from domestic mines; this was a major factor in the recent shortage of supply which necessitated raising the price sufficiently to assure continued large scale imports of foreign zinc concentrates—imports which would not have been required in such quantities had our own mining industry been enabled to maintain normal production.

Andrew Fletcher, in an address presented at the recent mining conference in Denver, revealed the results of a study showing that consumers who were regularly in the market for a monthly supply of lead and zinc actually paid more for their metal than they would have if prices had remained constant over a period of years. In a free and competitive economy it is obvious that the prices cannot be fixed at rigid figures and it would be undesirable if they could. On the other hand a greater degree of stability is rightfully being sought by the domestic mining industry. In discussing methods to attain this end, Fletcher eliminated tariff increases, subsidies, import quota systems and Government stockpiling as being "either politically or 'practically' unsatisfactory." He proposed a logical solution which would work to the mutual benefit of consumers, the mining industry, the national security and the Federal treasury—a simple import tax to be applied to imported metals when the domestic price falls below a certain base.

In explaining the application of such a tax to lead and zinc Fletcher said, "A tax of two cents a pound would be applied to imported lead and zinc whenever the U. S. prices averaged below a specified base level, which might well be established initially by the Department of the Interior, possibly working with the Industry Advisory Lead and Zinc Committees and consumer representatives. If 1956 does not bring new wage, freight, and other cost increases to non-ferrous metal producers, this base level might be set at lower than present prices. The tax on concentrates would be 75 percent of that on metal, and on all imports it would probably be practical to consider the date of the bill of lading as the date for determining whether or not an import tax were due. If prices rose again and averaged higher than the base levels for a month, the tax would be suspended. There would be no sliding-scale feature, and the proceeds of this tax would go into the U. S. Treasury."

He pointed out that Congress accepted this principle in dealing with lead and zinc during the Korean War, when it suspended import duties at high prices and later reinstated them when the prices dropped below levels set in the law. Under existing law the two cent import tax on copper is required to be suspended when the domestic price on electrolytic copper exceeds 24 cents for any calendar month.

Fletcher emphasized that for the domestic mining industry the proposed tax would tend toward establishing both a ceiling and a floor in the market and would thus maintain our vital lead and zinc industries on a more even keel. This would eliminate many situations where it is necessary to close down and later reopen mines at great expense to the mine operators and at deplorable waste to our national economy. All too often a shutdown results in the complete loss of natural resources which could have been extracted had prices been stable, but which, having been abandoned, can never be recovered because of deterioration of the mine workings.

Fletcher observed that the import tax "most clearly approaches meeting the test of effectiveness, automatic operation, fairness, and feasibility"—and is thus the best practical measure yet devised to solve the industry's problems.

"Drew" Fletcher's outstanding qualities of leadership and sound economic reasoning will command serious regard for this proposal by all concerned. The objectives of the plan — stabilizing the industry, eliminating unnecessary waste of our national resources, and strengthening the national security—should gain it widespread support.

We urge Congress and the Administration to consider and examine it carefully with the mining industry and with consumers, in order that a constructive program be developed to assure a healthy domestic economy—ready to meet all the demands of peace or war.

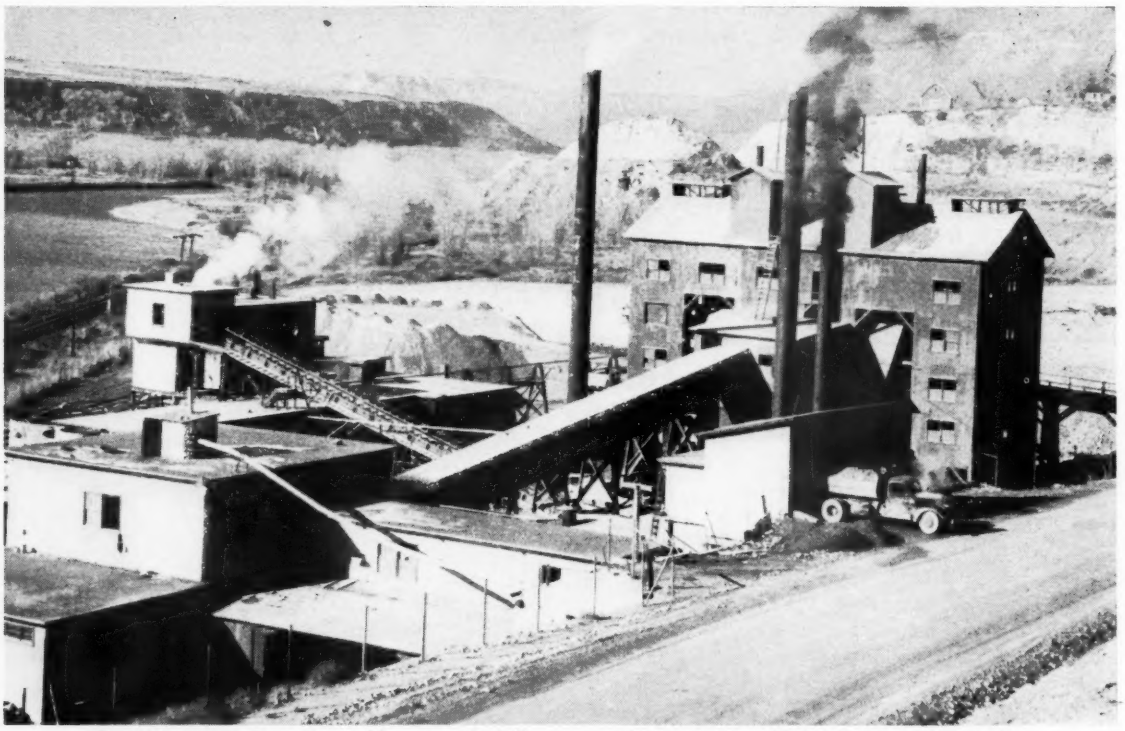
Abdication

HEARINGS on the Cooper Bill (H. R. 5550) to approve United States membership in the Office of Trade Cooperation (OTC), an international body to operate in Switzerland and to administer the General Agreements on Tariffs and Trade (GATT), began before the House Ways and Means Committee on March 1. The position of the American Mining Congress on this matter is covered by the following excerpt from its Declaration of Policy adopted last fall:

"We recommend that Congress reject participation in any organization which places the power to regulate trade and foreign commerce of the United States in the hands of any international body."

The nation's founders fought the American Revolution to establish the independence of our country, maintaining that the citizens have the right to govern themselves through their elected representatives. Now, for the sake of diplomatic expediency, our representatives are asked to consider passage of a bill to relinquish part of that right to an agency comprised of many nations and in which the United States would have only one vote—which would be cast by State Department representatives who may have little familiarity or concern with many of our domestic problems. Can our representatives really believe that they are justified in giving serious support to a bill which yields their responsibilities in our government to an international organization? In so doing would they not be derelict in fulfilling their obligation to the citizens whom they represent and to their sacred oath to uphold the Constitution of the United States?

Lime Penalty on Uranium Ores



Present uranium plants are unable to treat high lime ores without incurring added cost; hence the penalty

The Plain Facts on the Disadvantages and Regulations That Concern High Lime Content in Uraninite Ores—New Processes May Be the Remedy

By PAUL C. HENSHAW
Exploration Geologist
Homestake Mining Co.

THE following remarks pertain to uraninite ores of the Colorado Plateau and refer particularly to the black limey ores which have been indicated by drilling in the Chinle formation at the north end of Utex Ridge, San Juan County, Utah.

What Is the Lime Penalty

The lime penalty is a deduction from liquidation payments made on uranium-vanadium ores delivered and accepted at buying stations and mills. According to United States Atomic Energy Commission definition, payment for uranium-vanadium ores delivered and accepted will be at the prices set forth in Domestic Uranium Program Circular 5, Revised, except that a deduction will be made of one dollar per dry ton plus $0.30 per dry ton for each one percent of lime ($CaCO_3$) in excess of six percent, fractions in proportion.

Uraninite ores that must pay this penalty are divided into two metallurgical classes: intermediate lime, six to 18 percent $CaCO_3$; and high lime, over 18 percent $CaCO_3$.

Origin of the Lime Penalty

The first commercially successful process for extraction of uranium-vanadium from their ores was the acid leach method in which sulfuric acid is generally used as the solvent. Obviously, excess carbonates in any ores treated by this process would consume a corresponding amount of the acid reagent. Actually, consumption works out to about a pound for pound basis, that is, each pound of carbonate neutralizes a pound of sulfuric acid. To protect the uranium mills from the consequent extra reagent cost, the price schedule was set up to include a deduction or penalty for lime ($CaCO_3$) in excess of six percent. This penalty of one dollar for the first six percent and $0.30 for each additional percent $CaCO_3$ represents little more than the cost of extra reagent consumed in the extraction process. When the uranium ore buying program was set up, most known ores paid little or no penalty. Known ores with excess $CaCO_3$ were so limited in quantity that there was no economic pressure or incentive to modify the flowsheets of the then existing and projected plants. A peculiar quirk in the lime penalty derives from the fact that lime analyses are actually made for CaO which are then recalculated into $CaCO_3$. An ore containing $CaSO_4$ as well as $CaCO_3$ might be forced into the penalty bracket because of its high CaO content even though it contained less than six percent $CaCO_3$.

Disadvantages of High Lime

Handling of great quantities of highly corrosive reagents calls for very expensive corrosion resistant materials for the construction of tanks,

pipes, pumps, impellers, etc. Lime in the ore not only demands extra high concentrations of corrosive acid, but also fouls the mill circuit, plugs pipelines and fill tanks by subsequent precipitation of gypsum. Accordingly, in plants designed for acid leaching, unusually high lime content in ores not only increases reagent costs, but also adds greatly to construction and maintenance costs. Inasmuch as lime content differs in importance in the various uranium plants of the Plateau, special ore purchasing contracts suitable to the amenability requirements of any particular plant may be worked out with the private companies owning and operating those plants. However, it is probable that no reasonably low lime penalty could compensate operators of existing extractive plants for the extra problems as well as the extra costs in processing high lime ores.

Within the past 18 months, very considerable tonnages of intermediate and high lime ores have been indicated by drilling on the north end of Utex Ridge in the Big Indian District, San Juan County, Utah. There some entire orebodies average as much as 25 percent $CaCO_3$. Reserves of many hundreds of thousands of tons are involved. Penalties ranging between three and more dollars per ton on high grade uranium ores would represent a tremendous loss to the miner.

Ore Reserves

At the north end of Utex Ridge lime penalties would prohibit the economic exploitation of many tons of marginal uranium ore with intermediate or high lime content. It is not unreasonable to make the projection that in this area alone at least 100,000 tons, and possibly twice that tonnage of ore containing .20 percent U_3O_8, would be left in the ground as economically unavailable under the original lime penalty system.

Alternate Lime Penalty Schedule II

On August 14, 1955, the United States Atomic Energy Commission released a modified schedule for lime penalty at the government-owned uranium processing plant at Monticello, Utah. This new Schedule II states that payment for such ores delivered and accepted will be at the prices set forth in Domestic Uranium Program Circular 5, Revised, except that no payment will be made for vanadium and a deduction of $3.70 per ton will be made.

Payment for high lime ores purchased under special procurement contracts will be made under whichever schedule the buyer determines will give the greater return to the shipper.

The flat lime penalty of $3.70 per ton on Schedule II equals the penalty on 15 percent lime under the Schedule I. Therefore the ores benefited by Schedule II include only the very highest lime bearers of the intermediate (six to 18 percent) lime group and practically all of the truly high lime (18 percent plus) ores. Inasmuch as vanadium is not paid for under Schedule II, almost all of the intermediate lime ores and even a few of the high lime ores are still sold to better advantage under lime penalty Schedule I.

Schedule II is certainly a gesture in the right direction. Within the economic limits and amenability requirements of its Monticello plant, the Commission is granting benefits to the ore producer. However, Schedule II will do very little to reduce the lime penalty on uranium ores which are going to be mined in any case,

A process that could treat high lime ores economically would open up new potential deposits for the prospector

almost all of which are in the intermediate lime class. Schedule II may make available for mining somewhere between 10 percent and 20 percent of the very high lime ores which would have been left in the ground under Schedule I.

Evaluation of Penalty

Without directly revealing ore reserve figures for the north end of Utex Ridge, it can be stated that ore producers there will pay lime penalties amounting to many millions of dollars. It can be further stated that Schedule II will save only a few tens of thousands of dollars for the producers. The solution to the problem faced by miners of intermediate lime uranium ores cannot be solved by shaving closer to the economic limits and amenability requirements of processing at the Monticello mill or at any other existing mill on the Plateau.

There is one logical way to avoid the tremendous material and economic losses involved in mining and processing uranium ores of intermediate and high lime content. That way can be found in the field of uranium metallurgy.

The problem of extraction of uranium from limestones was met and conquered in the Grants area. Now a solution must be found to the problem of extraction of uranium from intermediate and high lime ores of the north end of Utex Ridge. The problem involves not merely the relative abundance of uranium, vanadium and lime in the ores. The metallurgist must consider the total physical and chemical nature of the north end ores. The goal would be an extraction process with no penalties.

New Extraction Processes

Penalty free processes for extraction of uranium from uraninite ores containing intermediate to high lime have been worked out on a laboratory scale. Some metallurgists believe that these processes entail extraction losses higher than the losses sustained in the acid leach process. Even if they exist, these additional extraction losses are very minor compared with the very substantial losses of uranium reserves which will be left in the ground because of the lime penalty. Mine recovery is certainly as important a consideration as metallurgical recovery. If no effort is going to be made to foster increased mine recovery of known reserves, it appears that we shall be committing the not uncommon, but completely unpardonable, error of allowing mill policy and mill flowsheets to be dictated by the mill experts rather than by the nature of the ore deposit.

Beneficial Effects

In the field of prospecting, elimination of the lime penalty will remove a depressing effect on the attitude of venture capital. This may not seem important right now, nevertheless the effect is there. In the field of development, elimination of the lime penalty will encourage the miner to undertake expensive shaft and drift operations to go after blocks of uranium ores which might otherwise be left unprospected.

In the field of mining, elimination of the lime penalty will bring into production hundreds of thousands of tons of marginal grade uranium ore which would otherwise be left unbroken in the ground. Finally, the very act of mining marginal ores will certainly lead to discovery of additional reserves in ground adjacent to the marginal stopes.

There would be available an ore reserve very handsome in both grade and total tonnage for any uranium extraction plant located reasonably near the Big Indian area provided that that plant is designed around a no penalty process.

The operator's view of the 90-ton capacity bucket he controls

The Mountaineer

Hanna's $2,600,000, 60-cu yd Shovel Goes to Work Uncovering 4½-ft Pittsburgh Seam in Eastern Ohio

THE Hanna Coal Co. Division of Pittsburgh Consolidation Coal Co. has begun evaluating its decision to construct the largest piece of mobile land-mounted machinery ever built in this country. That was a critical decision. In contrast to conditions in the coal industry today, the future did not look so bright when it was decided to make the tremendous machine. That the coal company had to have great faith in the future of the industry goes without saying.

Another kind of faith was demonstrated too—faith in the ability of the men who designed the machine. For in its own way, it was like crashing the sound barrier. Despite the many thousands of hours which went into the design and despite the combined engineering ability of Hanna's management and leaders in the shovel and electrical design industries, there was a certain amount of engineering gamble. The two main points in question were (1) could a 60-yd dipper be filled and (2) would the required weight exceed the optimum weight for such a machine?

Hanna management feels that there is a definite upper limit in bucket size. They know they have not passed that upper limit with the 46-yd buckets they have used for some time, and they feel that they have not passed it with the 60-yd bucket. However, only time will tell.

As far as optimum weight is concerned, the primary problem is inertia of the upper frame in starting and stopping the swing motion, and the time required to swing. There is not much point in building a 60-yd shovel if it takes twice as long to complete a cycle as with a 30-yd shovel.

Early indications are that both of these problems have been resolved satisfactorily. On the coal, stripping overburden since January 28, field performance has shown the bucket is being filled satisfactorily and that the time to complete a swing cycle is not greater than expected.

Electrical Design

Design of a shovel with more than twice the power of any similar machine previously built presented a real challenge. First, the coal company outlined the specifications that the machine they envisioned would have to meet. Preliminary consideration of the power requirements of the giant shovel indicated that it would be difficult, if not impossible, to provide adequate control power to give the operating speed required to meet a duty cycle as fast even as that of the shovels used heretofore, and the cycle envisioned was considerably faster than for those machines.

Power equipment and controls had to be developed from scratch, a job which fell to the General Electric Co. Such a problem can hardly be readily, economically and accurately solved by a model and it was decided to use the analog computer technique as used in connection with various other electrical engineering problems. By the use of an electronic computer, electrical equipment was designed and run through simulated adjustments and tests in a minimum of time and without incurring any preliminary construction and testing expense. Characteristic design details of the various machine fields and amplistat-amplidyne controls were worked out and checked on the computer. A large number of duty cycles for each of the various shovel motions were run through to disclose the results in power use, speed, acceleration, shock loading, etc., of various schemes of control and various adjustments. From these the best arrangement of equipment and adjustments were determined.

Fabrication of parts for the machine started in October 1954 in the shops of the Marion Power Shovel Co. at Marion, Ohio. Actual erection of the machine, or the Marion 5760 as it is officially designated, required approximately 7½ months, with the first crawler being set into position on June 2, 1955. Parts were shipped as required by railroad car to the construction site near Hanna's Georgetown No. 12 mine at Adena, Ohio. The machine moved from its erection site on January 19, 1956.

Statistics

Now for a few figures on the machine. One dipper-load (some 90 tons) will fill a room 10 ft by 20 ft by 8 ft high. A complete cycle—digging, swinging, depositing overburden and returning for another load—was designed for 45 seconds. At this rate,

the machine will handle approximately 14,400,000 lb of material each hour—almost three times its own weight of 5,500,000 lb (2750 tons). The shovel's 150-ft boom and its 92-ft dipper handle make it possible to deposit the overburden 290 ft away and stack it in piles almost 100 ft high.

While it is true that the dipper on The Mountaineer is larger than any other ever used before, this is not the principal factor which gives the shovel its increased capacity. Two main factors contributing to the enlarged capacity over Hanna's other stripping shovels are; (1) the 30-ft longer boom and the 32-ft longer dipper handle, which make it possible for the machine to remove greater depths of overburden, to deposit it further away, and in higher piles; and (2) the increased speed at which the shovel operates in all of its functions, making possible faster operating cycles.

From ground to boom tip, the shovel rises 160 ft into the air. Each of the eight crawlers upon which the shovel stands and moves is 8 ft high, 23 ft long and 54 in. wide. Each individual crawler weighs 60 tons and each pair is powered by a 250-hp motor. Crawler bearing area is 704 sq ft, giving a bearing pressure on the ground of 54.3 lb per sq in.

The Mountaineer has a total lifting power (bail pull) of approximately 500,000 lb. This means that it has the power to lift a platform containing 166 ton-and-a-half automobiles 100 ft into the air, swing them through the air for 290 ft, set them down on top of a 10-story building and swing back for another load—and all of this in 45 seconds.

Herringbone driving gears which operate the twin hoist-cable drum are 13 ft in diameter. The two dipper hoist cables are 2½ in. in diameter. Four automatic, electrically-controlled hydraulic leveling jacks, one at each corner of the lower frame, keep the revolving upper portion of the machine absolutely level while operating even though the machine might be standing on uneven terrain. Each of some 500 bearings on The Mountaineer is greased automatically. A pump, controlled by an electric timing device, pumps lubricants through a piping system to each of these bearings at pre-determined intervals.

Only one man is required for actual operation of The Mountaineer. He will control all operating functions on the machine by the use of two foot pedals, two hand levers and one whistle cord. In addition to the operator, an oiler will be used to check performance of the lubrication system and to perform minor repair work. As it becomes necessary to move the machine forward, one man on the ground will aid in operating and steering the crawler mechanism. The operator's cab, three stories above the ground, is equipped with electric heating, air-conditioning, a sliding picture window, vinyl tile floor and is finished with imitation wood paneling.

A view of the shovel boom from the top of the shovel. Note the man at the top of steps on the right

Another unique feature of The Mountaineer is a three-passenger automatic elevator. It is installed in the six-ft center pin around which the upper portion of the machine revolves. In boarding other large shovels it is necessary to climb a stairway and step from the stationary lower deck to the revolving upper deck. Stopping the machine is objectionable and the hazard of being injured by the machine's starting prematurely or by the person's attempting to step on to the revolving deck while it is in motion has always been a problem. The elevator makes it possible to board the machine safely while it is in operation.

Power Demand High

Power is transmitted to the shovel through a 250 mcm, type SH-D, rubber armored, four in. diameter trailing cable at 6.9 kv from a 5000 kva, 66,000-6900 volt portable substation. This marks a new development in power distribution to large coal-stripping shovels. Heretofore it has been almost universal to use 4.16 kv for such duty. The large amount of power involved in the operation of the new shovel makes use of the higher distribution voltage imperative.

Each of the drives powering the shovel's various motions have their own generators because of the type of variable voltage controls used. Two motor generator sets supply d-c power under Ward-Leonard control for the main motion motors. The larger set is driven by a 3500-hp, 3500-kva 0.8-power factor, 1200-rpm synchronous motor. This motor drives four 400-kw 250-volt d-c hoist generators, each having a no-load voltage of 600 volts and a stalling current of 3200 amp. The large set also includes a 330-kw 500-volt d-c generator for supplying power to the two crowd motors connected in series. The ceiling voltage on this generator is 110 volts and the stall current is 1350 amp. A smaller set—a 1000-hp synchronous motor driving two 330-kw 500-volt d-c generators—supplies power to the four swing motors. These generators have 1100-volt no-load and 1350-amp stall characteristics.

The hoist motion is powered by four 450-hp motors giving a maximum effort of approximately 4000 hp. There are four vertical swing motors totaling 750 hp and two crowd motors, each rated at 187½ hp. All of the

Lots of brains, human and electronic. These men—(left to right) J. F. Weiss, chief electrical engineer, Marion Power Shovel Co.; C. H. Thomas, G. E.'s analytical division; A. F. Busick, vice-president, Marion Power Shovel Co.; and David Stoetzel, G.E. systems application engineer—watch an analog computer working on design problems

To its very tip The Mountaineer rises 160 ft into the air

main driving motors are of the heavy duty, armoured, mill-type construction with forced ventilation by individual, motor-mounted induction-motor driven centrifugal blowers.

Control equipment is of the amplistat-amplidyne Ward-Leonard type for each of the three motions. This results in maximum control of acceleration, deceleration, current, torque and power peaks and plugging.

Special type motor field control equipment is provided for the 3500-hp synchronous motor which powers the hoist motion, to give it extremely high torque characteristics under heavy load and to provide leading power factor characteristics for the improvement of mine voltage conditions under heavy loads. Hoist motors on Hanna's 46-yd shovels provide maximum bail pull at zero speed after which the pull drops off fairly rapidly. The torque curve of the hoist motors in the Marion 5760 is much flatter because of the special motor field control equipment. A special type of motor field excitation is provided to vary the motor characteristics smoothly and in correct ratio to suit the different phases of the operating cycle. Hoist motors on the new machine can accelerate from zero to full speed under full load in one second.

The total equivalent horsepower of the installed electrical equipment is in excess of 12,000. However, since all of the main motors and generators are actually capable of operating continuously at twice name plate capacity, the actual electrical content is almost 20,000 hp.

Total peak power demand of the machine will be 6840 kw. Electrical engineers estimate that, at full continuous operation, the shovel will utilize as much electricity as do 5200 average homes.

Evolution of the Big Shovel

When Hanna started open-cut mining in Eastern Ohio in 1940 an eight-cu yd shovel, which had originally been put in service during World War I on the iron ore range in Minnesota, was brought to Ohio to use in removing overburden from the coal seam. This shovel, which at the time of its erection was a "big" shovel, had a definite limitation. It could remove overburden averaging only 45 ft high. Later, a new 17-yd shovel was purchased and erected. A 24-cu yd dipper was installed at a still later date on this machine. It could then remove overburden to depths averaging 55 ft.

The next step in the evolution of open-cut mining equipment at Hanna was a 35-yd machine put in service in 1944. Subsequently, three additional machines of this type have gone to work at Hanna, but all four are presently equipped with 46-yd buckets. These machines, with their 120-ft booms, a maximum dumping height of 80 ft, and maximum dumping radius of 120 ft, are able to move overburden of an average maximum depth of approximately 70 ft.

The Mountaineer has the ability of removing overburden of an average maximum depth of 90 ft (under favorable contour conditions the machine will be able to go to a top maximum of 120 ft of overburden).

Control center of The Mountaineer—the operator's cab. Floored with vinyl tile and finished in imitation wood paneling, it is heated and air conditioned—a worthy place of work for the man who runs the $2,600,000 machine

This Paul Bunyan of the mining industry will operate in areas where the smaller shovels have previously reached their maximum depth. In other words, it will take over where the other machines left off.

It should be noted that the new shovel supplements, but does not replace the other shovels. They will remain at work.

Construction of a machine as large as this had to await the development of high-strength alloy steels. Hanna started development of this use of alloys in excavating shovels back in 1943. Through their use evolved the 46-yd dippers which replaced the original 35-yd dippers on the four Marion 5561 shovels now moving overburden for Hanna. The alloy steel used in the front end of the new machine is about two times as strong as carbon steel and has the ability to be welded and still keep its physical properties. Because of its increased strength, its use permits a reduction in gross weight. This in turn made possible the use of the long boom and big bucket without overbalancing the shovel. As it is, 1,000,000 lb of ballast

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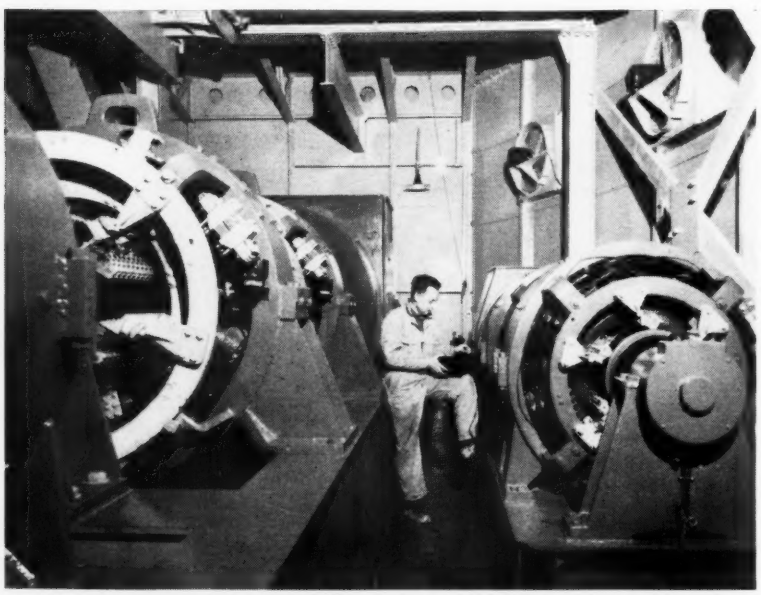


This main motor generator furnishes power to the hoist, swing and crowd motions of the shovel

View in a stope looking towards the service raise shows rock bolts used for support of hanging wall and ore in back

Changes at Mountain Con

Rock Bolting, Communications, Tailings Backfill, and Improved Blasting Contribute to a 12 Percent Cost Cut in Older Butte Operation

By V. D. O'LEARY
Mine Superintendent
The Anaconda Company

MOUNTAIN CON is one of the oldest operating mines of The Anaconda Company in the Butte district. It is a narrow vein copper mine and has been a continuous producer for over 70 years. Situated nearly at the top of the so-called "Richest Hill on Earth", it is the deepest mine in Butte, both in length of shaft and in elevation. Ore zones lie northwest, south, and southeast of the shaft. These are interpolated by east-west veins, northwesters, and southwesters, which as they pass through the zones, become ore-bearing. Often the farthest extremity of the ore shoot in any particular vein is 4000 ft from the shaft, and as the veins generally dip 65°, this extreme distance is increasing with depth in many cases.

Rock Bolting Adopted

All Mountain Con veins are accompanied by a false hanging wall which is damp and blocky, and varies in thickness from 6 to 15 ft. The ore is heavily mineralized, full of clays and fractures. It has always been considered too weak to stand without timber support, although some years ago untimbered cut and fill stoping had been tried, but had to be abandoned because of delay in filling. Perforce, nearly all Mountain Con excavations had been timbered as recently as two years ago. The stoping was in the square-set, or variation of square-set tradition, and the timber service problem was becoming very acute as the shaft gradually deepened. Ground temperatures, too, were slowly creeping toward 130°, and open areas and mine-waste filled gobs were diminishing the effectiveness of Mountain Con's unique air conditioning system.

As of today, however, less than 23 percent of Mountain Con excavations are timbered, and working conditions are comparable to those in many mines working much closer to surface. This came about because a program for changing the method of ground support and the type of stoping was instituted. Rock bolting now is universal throughout the mine, and the stoping is untimbered horizontal cut and fill with smelter tailings the medium of fill.

Both of these changes were the result of many alterations not only in drilling, blasting, and filling, but in the habits and manners of the men involved from supervisor to miner.

Better Shaft Utilization

Rock bolting was first introduced in sill work. Internal pressures, air slackening due to humidity changes, and concussion from blasting had dictated that nearly all of Mountain Con advance be timbered. This not only slowed down the work but involved doing one-third more excavation than was necessary. With rock bolting the openings are driven in a shape roughly conforming to a Gothic arch. The bolts are installed in a pre-determined pattern, and every heading is kept bolted within two or three ft of the breast. The result has been that useless excavation has been turned into ft of advance, so that as much as 100 percent increase has been noted in some headings. The over-all cost has been decreased by $7.00 per ft of advance. Since three miles of sill advance per year in Mountain Con is not unusual, the savings are considerable. The elimination of some 3000 sets of sill timber in that same period makes available more shaft time for productive work.

Use of rock bolts and war surplus landing mats for ground support

Rock bolts play a very vital role in the elimination of timber in the new stoping operation. From knowledge gained in the operation of conventional horizontal cut and fills it was apparent that untimbered stopes were possible provided the ground was worked fast. Rock bolts extend the time before ground failure can be expected. For example, the blocky hanging wall of Mountain Con veins is continually moving and exerting a drag on the ore at the contact. Rock bolts placed immediately before blasting slow up this movement for an indefinite period, and permit the exposing of the wall for as much as 100 ft in length and 16 ft in height, something that was unheard of a few years ago. Pattern bolting the back in a simulated arch form ties in eccentric joinings and permits the back to be otherwise unsupported for a length equal to that of the hanging wall. Since rock bolting is a simple and speedy operation as compared with timbering, the premise for fast working of the ground is considerably enhanced by its use.

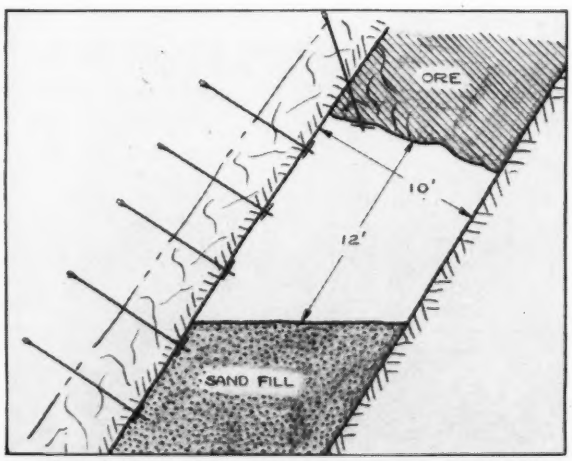
Communications

For eight years experimental work with tailings fill had been going on at Mountain Con. Out of this work had come a method of filling stopes which made use of unselective tailings from the Anaconda Smelter. The density of these tailings is very high and the clay content very low. Due to the horizontal distances involved the tailings are relatively thin, running 55 to 60 percent solids. Draining in the stopes is strictly by decantation through filter walls formed of lagging and burlap. The distance from the emulsion plant on surface to the discharge in the stope is usually more than 9000 ft. A telephonic communication system keeps discharge men and plant operators in constant touch so that failures in filter walls or lines are reported with a minimum loss of time. Since stopes requiring fill are sometimes as much as two miles apart and two teams of discharge men are regularly in action, the telephone system speeds the switching of the tailings from one crew to the other. An average of four stopes are filled by these crews in eight hr.

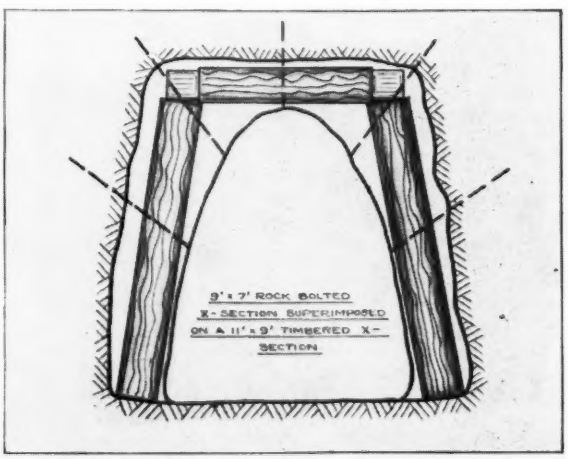
The actual stoping operation consists of a series of breastings covering the determined length of the stope, and requires rock bolting, clean out of broken ore, raising of chute, installing of the filter wall and the placing of fill. The stopes are breasted down so that back and hanging wall can be supported with rock bolts before too much ground is opened. Also, breasting down allows greater control in keeping the back normal to the walls which gives the strongest natural support. Holes are drilled flat and parallel, thus aiding in keeping the back smooth and reducing the danger from underhanging pieces. The depth of the cut depends on the strength of the hanging wall and varies from 8 to 12 ft. The length of the stope is governed by ground conditions, but anywhere from 50 to 100 ft is worked efficiently and in widths up to 25 ft. The length of each round is approximately 11 ft, about a 100 percent increase over previous stoping rounds. Push feed drills and tungsten-carbide bits made the job of horizontal drilling and long rounds a relatively easy task. Miner acceptance of push feed drills was slow at the start but as knowledge was gained in handling, the machines now have become exceedingly popular.

Improve Blasting Methods

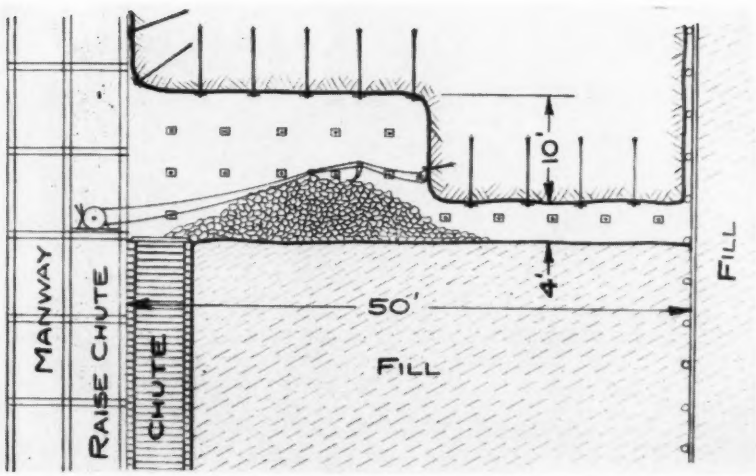
In order to prevent the tendency of the ore to slab off with long rounds millesecond blasting has been introduced and fragmentation is controlled. Scraping time lost due to secondary



Rock bolting pattern shows back tied to hanging wall



Rock bolted drift saves on timber and excavated volume



Sketch shows stoping operation adjacent to a worked-out tailings-filled stope

Cost Per Ton Cut 12 Percent

Comparative statistics tend to show that the changes in the stoping method worked effectively despite continually advancing costs in material and labor. A recent operating period as compared with one before the change show the following results:

Tons per stope increased	43.6%
Explosive cost per ton declined	15.9%
Timber cost per ton declined	58.2%
All supply cost per ton declined	26.3%
Total cost per ton including wages declined	12.3%

The small amount of area open in the stoping operations plus the air-tight tailings have allowed a 100 percent utilization of output from the air conditioning plants, thus providing for concentrated mining in ore shoots as much as 2000 ft in length. Control of ventilation is now more absolute than ever before. A definite program to fill old waste-filled gobs with tailings is also under way, and a future benefit from this can be expected.

Future plans are directed toward improving the percent solids that can safely be carried in the tailings line, and experimental work toward that end is now going on. Test work with three-drum hoists has been favorable, and with another increase in width of scrapers, it appears certain that clean-out time, still a troublesome problem, can be shortened considerably.

blasting is minimized. It is now possible to break the ground with fewer holes, since in millesecond blasting both spacing and burden can be increased. Since all the holes are flat and parallel, the strength of the powder has been reduced by one-third. To take full advantage of the long holes powder sticks have been doubled in length and made crush-resistant, so that the time-honored habit of tamping all the powder to the bottom of the hole has been discouraged. Less than one-half the number of holes are required to break the equivalent amount of ground broken in previous stoping operations. These changes had the beneficial after-effect of reducing vibration, thus decreasing the cracking and shattering of the hanging wall during blasting. Despite more expensive detonators and higher cost in powder the actual explosives cost per ton has decreased.

Burlap covered fill wall in stope before filling

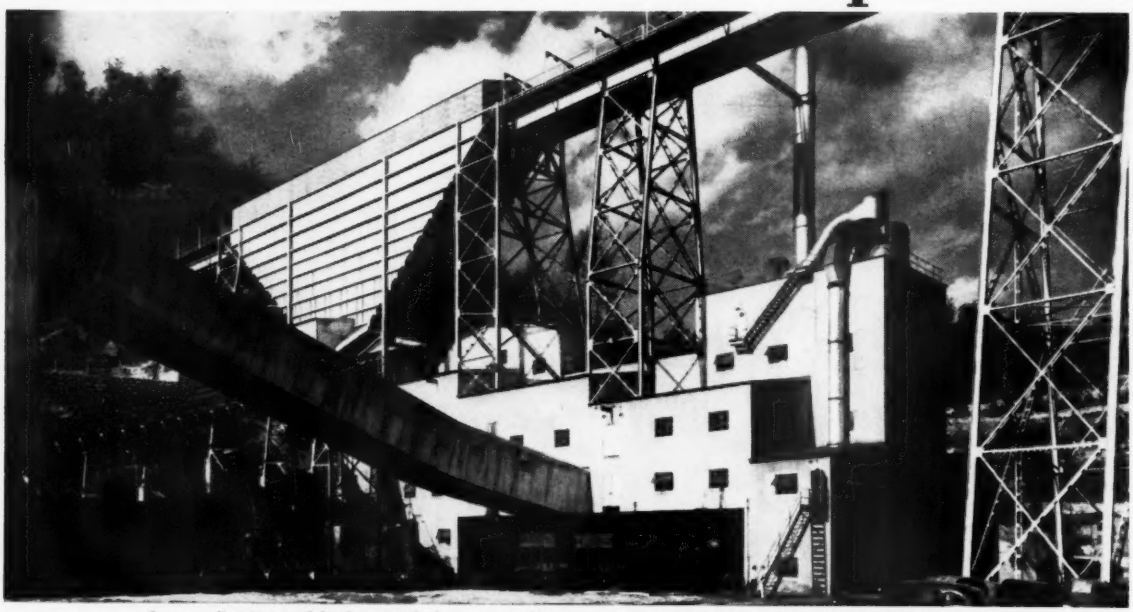
Redesign Slushers

Scraping equipment had to undergo considerable revision to keep pace with the stepped-up breaking cycle. In order to keep the drills going large amounts of broken rock has to be moved in the shortest possible time. Expansion room between fill and back accommodated about one-half the average round. The rest of the rock has to be moved quickly so drilling can start, and in the clean-out period one-half of the total cut has to be moved in two eight-hr shifts. The result is that slusher hoist horsepower has increased 67 percent on the average, and scraper capacity has increased 122 percent. The scrapers themselves underwent a change in design when it was found that considerable delay was caused by trenching and overturning of the high, unwieldy types then in use. Now the scrapers are low and wide, which makes them practically impossible to overturn and manimizes the chances of trenching. They are equipped with side cutters both for sure digging and speedy repair.

All stoping at Mountain Con now is dead end. The inside end of the cut is either against solid ground, or against a worked-out tailings-filled stope. Thus, extra chutes and manways have been eliminated. The original raise manway is the only manway and the chute is a 5 by 10 crib carried along with the stope. Repair work in the chute has been cut to a minimum, and the crib offers a safe and convenient drain for the necessarily large amount of run-off from the fill.

The rapid operation of the stopes means that there are fewer shut-down periods, and therefore, fewer stope units are required to get the same tonnage. This means ultimately that manpower can be distributed more effectively for greater tonnage.

Trends In Coal Mine Operation



Low realization and high capital charges to offset part of the gains from increased mining efficiency

Production Per Man Day Rising as Top Producers Get Bigger Share of Market

By RALPH E. KIRK
Consulting Engineer
Birmingham, Ala.

SUBSTANTIAL improvement in market conditions in 1955 was a very welcome turn in a long lane. Probably several operations, destined a year ago for abandonment, will be modernized and kept in operation. Grounds for optimism were found in the rapid expansion of steam generating facilities in production of electrical energy, high operating rate of the iron and steel industry, conversion from other fuels to coal by a number of industrial plants, and the over-all tremendous growth of the country's economy.

Need to Cut Production Costs

However, the encouraging outlook for volume of sales was drastically tempered by the realization of the great importance of selling prices in the still highly competitive fuel market, and therefore, of production costs. Inasmuch as there seems to be no valid reason to expect any downward adjustment in the wage rates embodied in the collective bargaining agreements of the industry, the logical avenue to significant reduction of operating costs is successful use of labor saving equipment to the greatest practicable extent. The coal salesman found purchasing agents fully informed and dully impressed by some published announcements, two of which are here summarized as examples:

> "TVA purchased during the fiscal year 1955 approximately 12,000,000 tons of coal, at an average cost of coal received of $4.33 per ton, including handling cost at the plant for an average cost of 18.11 cents per million Btu; 'and' TVA in November 1955 awarded contracts for 3,558,856 tons of coal valued at $10,389,483, averaging less than $2.92 per ton."

Moreover, the typical volume consumer of coal is only mildly interested in quotations f.o.b. mines but vitally interested in the cost of fuel at the point of actual combustion. Producer-owned or financed transportation facilities from mine to market are becoming increasingly important in view of the steadily increasing tariffs for railroad transportation, and the car shortages that have developed recently as a result of less than 20 percent improvement in the market conditions from the previous year.

The following situations, although not typical, are nevertheless significant:

(1) Construction of the 108-mile pipeline from the cleaning plant of Pittsburgh Consolidation at Georgetown, Ohio, to the east East Lake Plant of the Cleveland Electric Illuminating Co.

(2) Coal will be transported approximately 1800 miles from Uniontown, Ky., to the steam generating plant of the Tampa Electric Co., in a fleet of coal company barges.

(3) A river towboat, designed to move 20 barge loads of coal—approximately 19,000 tons—in a single trip upstream against the current of the Ohio River, was ordered by Island Creek.

(4) The leading commercial coal producer in a Southern State is also the leading commercial barge line operator of that State.

(5) Announcements of selections of sites for new aluminum plants, with proximity to large coal fields—an important factor in making final decisions—were made.

Naturally, some coal mine operators, after careful study of individual situations, still find it advisable to discontinue certain operations rather

than to undertake another program of capital expenditures.

This is especially true where reserves of unmined coal are comparatively limited, or the operating property so extensive that costly revamping of hoisting, main haulage and cleaning plant facilities would also be required to meet the changed conditions that would presumably result from mechanization at the working faces.

Expansion Costs High

In the enthusiasm that greets the announcements of awe-inspiring tonnages per face man shift, the cold fact emerges from the welter of claims that capital charges on the order of $1.00 per ton of annual production are not unusual to cover the cost of a rounded program comprising face equipment, cleaning plant and refuse disposal facilities, revamping of hoisting and haulage facilities, shop and other maintenance facilities, including purchase of sufficient spare units. Capital charges of this magnitude, when considered in the light of some sales prices that are remindful of 1946, cannot be considered encouraging by the operator not already well entrenched market-wise or else with excellent prospects of becoming so. Unusually good conditions of production and marketing may, and frequently do, provide a favorable economic climate for the survival of the small operator without his undertaking a program involving relatively large capital expenditures, but such must be considered the exceptional case.

However, operators who can plan confidently on attaining ultimate production in underground operations of at least 15 tons per man-day are facing the future with considerable confidence. A recent, but unofficial, estimate of the average production per man-day in the industry in the fall of 1955, was 10.89 tons. This compares with 8.17 tons reported for 1953, and 9.00 tons for 1954. A survey in 1954 by a well known agency covered 177 mines. It showed an average production per man-day for these mines of 16.42 tons. Admittedly, the physical conditions of these mines are considered above the average in the industry, however, there appears to be good reason to believe that the production of 6.30 tons per man-day for 1946 will be doubled in 1957. The trend is unmistakable.

Production Concentrated

Another trend of considerable current interest doubtless continued in 1955, although figures are not yet available, was the percentage of the Nation's total production that was mined by the top 50 bituminous coal operating groups. During the seven-year period, 1948-54, this percentage steadily increased from less than 42 percent to 54 percent. The latter figure, incidentally, was lowered by the protracted suspension of some captive mines as a result of labor conditions in the iron and steel industry. By 1957, if the trend continues as now indicated, the percentage should reach 60.

Contemporaneously with the growth percentage wise of the top 50 producers, the number of companies with annual production under 100,000 tons each, declined 38 percent, and those with production between 100,000 and 500,000 tons declined by 37 percent. In 1954, 563 coal companies, out of an estimated 5000 total, produced 84.5 percent of the Nation's coal.

The import of these statistics is that in 1955, as in the immediately preceding years, the volume production trend is toward the larger operating groups, where in general an ambitious program of mechanization involving substantial capital expenditures is a very important but not insurmountable consideration. That is, provided always that the program is soundly planned, and therefore an adequate return on the investment can be confidently expected by management.

Smaller Sizes More Acceptable

Lastly, in general retrospect for 1955, the trend toward trade acceptance of the smaller sizes for industrial and public utilities use continued, and there is every prospect that such will be the case for some time to come. Mechanical mining should be further advanced by the continuance of this trend.

In general, developments in 1955 added emphasis to these postulates:

(1) Coal is resurgent in the Nation.

(2) The top volume consumer of coal is and will continue to be the public utilities.

(3) Demand for coal is good, but the price level in the volume market offers no encouragement to the high cost producer.

(4) Low realization and high capital charges tend to offset part of the economies resulting from installation of labor saving equipment, thus emphasizing necessity for sound planning and skilful execution of mechanical mining programs.

(5) Within the industry the trend in the volume market favors the larger producers who can and will continue to equip their operations with the most productive equipment available.

(6) Mechanical equipment now available and in course of development will set the stage for new production records, per man-day and per unit-shift.

(7) Continuous mining is here to stay in increasingly greater measure.

River shipment of coal has become vitally important in reaching some markets

Geophysical Prospecting In New Brunswick

A Complete Account of How Newest Methods and Exploration Equipment Were Used to Find More Than 60 Million Tons of Lead-Zinc Ore Over a Three-Year Period

By HAROLD O. SEIGEL
Consulting Geophysicist
Toronto, Ontario

IT would be difficult to assemble a set of circumstances more favorable to the application of geophysical methods to mineral exploration than is present in the Bathurst—Newcastle area of New Brunswick (Fig. 1). Steeply dipping Ordovician sediments and volcanics are hosts to large tabular replacement bodies of lead-zinc-copper sulphides which are characteristically so high in pyrite or pyrrhotite that they are nearly massive. The Ordovician surface has been remarkably peneplaned and is presently covered by a thin but ubiquitous soil layer, partly residual and partly transported in nature, through which few outcrops penetrate.

That the area contains small base metal deposits has been known for the 300 years since it was first settled by the French. It has however remained for modern geophysical methods to penetrate the overburden and to demonstrate the existence of base metal ore bodies of the first magnitude. In the three years which have elapsed since the first discovery, at least 60 million tons of ore grade lead-zinc copper mineralization have been proven up, in four separate locations. Three of these deposits, including two of 25 million tons each, owe their discovery to ground electromagnetic methods, and the fourth is the first major discovery attributable to airborne electromagnetic techniques in Canada.

The ore grade mineralization is characteristically much more highly electrically conducting than its host rock or the overlying overburden. Electromagnetic induction, resistivity and self potential methods have all demonstrated easy detection of the various ore bodies. The mineralization

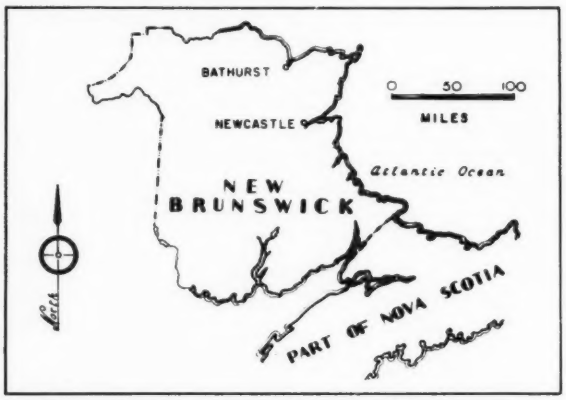


Fig. 1—The Bathurst-Newcastle area of New Brunswick

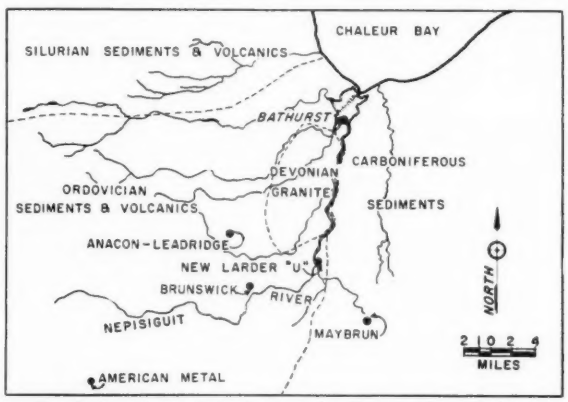


Fig. 2—Locations of the four newly discovered ore bodies

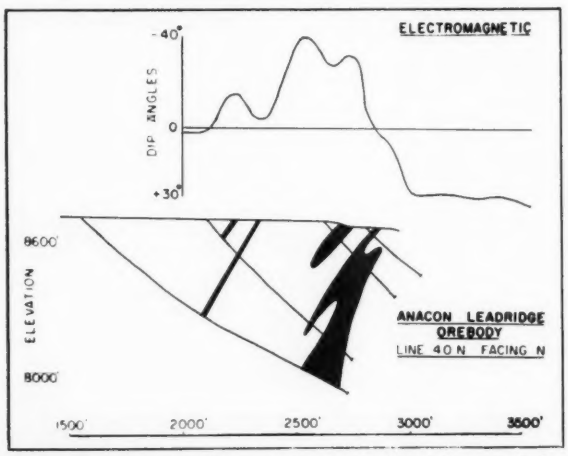


Fig. 3—A discovery profile over the Anacon-Leadridge ore body

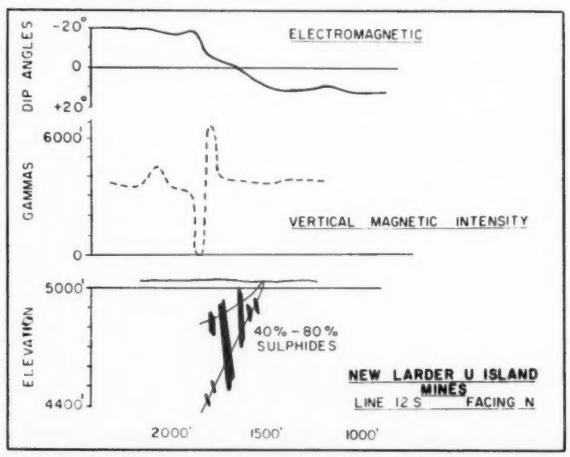


Fig. 4—A discovery profile over the New Larder U ore body

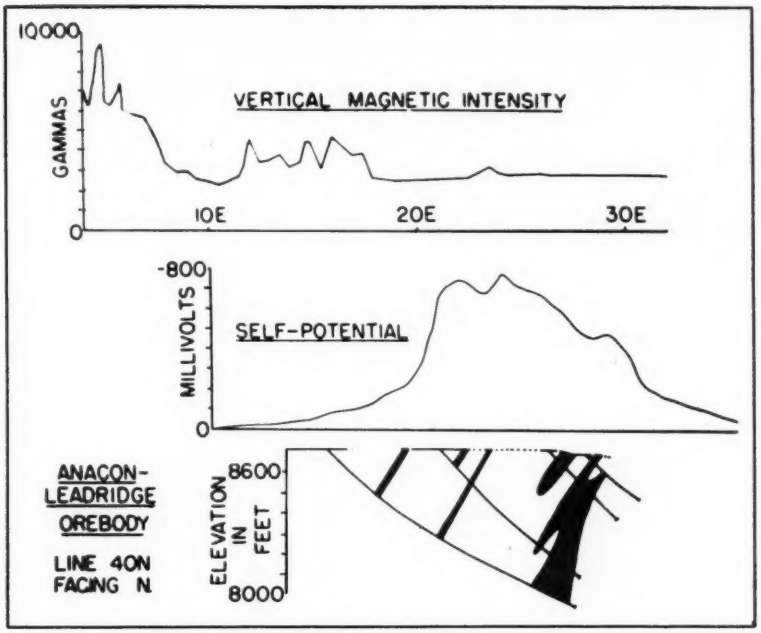


Fig. 5—Self-potential profile over the Anacon-Leadridge ore body

is also of considerably higher density than its host rock and the ore bodies because of their large size and shallow depth, show up clearly on gravimeter traverses.

Undesirable Conductors

In the positive sense, then, detection of sulphide bodies of economic interest is simple and straightforward. One may employ the gravimeter or one of the electrical methods for primary detection of zones of interest. The latter methods are usually preferred because of their greater speed and lower cost-per-line-mile. Unfortunately one finds that conducting zones, some of a size and conductivity comparable to the known ore bodies are extremely common. These undesirable conductors are due to graphite in shears and breccia zones

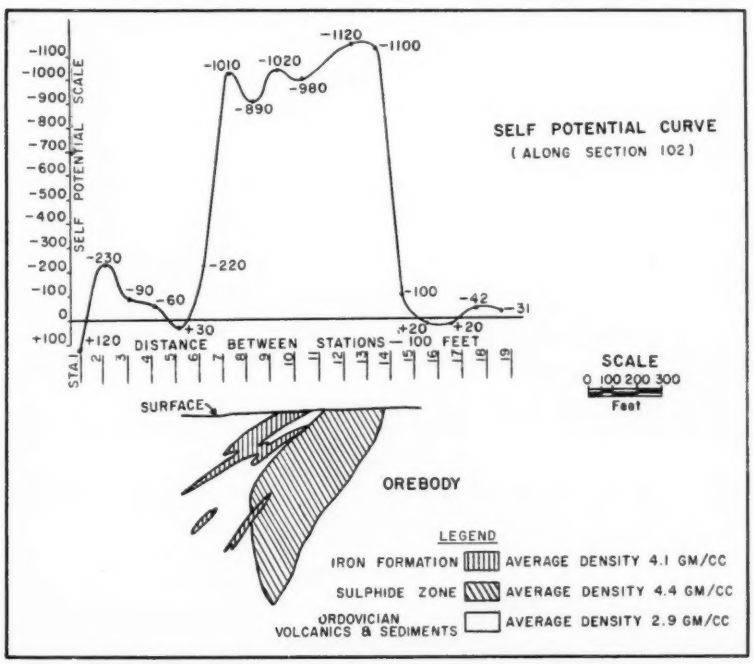


Fig. 6—Self potential survey—Brunswick ore body

in the Ordovician formations, and they outnumber the sulphide bodies by more than 200 to one, taking the area as a whole.

It has proven necessary to employ auxiliary techniques to select from the multitude of conductors revealed by the usual electrical survey the one or two which may be caused by base metal sulphides of possible economic interest. The gravimeter and geochemical soil analysis have been used extensively for this selection process. The soil analysis method, albeit more sensitive than the gravimeter to small amounts of base metal mineralization, has proven to be less reliable than the latter, particularly in areas of multiple conductors. Both are still being used, however, to good purposes.

The geophysical exploration sequence that has evolved is as follows:

(a) Primary detection of conducting zones by the use of some electrical method, usually electromagnetic induction.
(b) The investigation of the conducting zones using the gravimeter and/or geochemical soil sampling to determine which conductors, if any, could be associated with base metal mineralization.
(c) Diamond drilling of conductors exhibiting a favorable correlation.

Initially all electrical work was done on the ground and on properties that had been secured on the basis of geological reasoning. Since the introduction of airborne electromagnetic methods into the area, first (and successfully) in 1953 and more fully since the fall of 1954, the acquisition of property has been based to an increasing extent on the location of conductors discovered from the air. The airborne electromagnetic information serves to limit the amount of ground electrical work which is required. Some such work has still to be done to accurately locate the conductor on the ground prior to the use of the auxiliary methods mentioned above. Figure 2 shows the location of the four ore bodies which have been discovered to date in this area. The more prominent geological features of the area are also shown. The Brunswick and Anacon-Leadridge ore bodies, owned by the Brunswick Mining and Smelting Co. Ltd. each contain about 28 million tons of ore averaging about five percent zinc, 1.7 percent lead, 0.5 percent copper and 1.6 oz of silver. They were discovered by a ground electromagnetic technique in the fall of 1952 and the spring of 1953. The same technique in the spring of 1953 was responsible for the discovery of the New Larder U ore body of Anacon Lead Mines Ltd., containing an estimated 1,173,000 tons of ore averaging 8.2 percent combined lead and zinc. The last ore body to be discovered is really at least three separate ore zones owned by the

Field geologist operating a potentiometer.

American Metal Co. These were discovered in the early stages of airborne electromagnetic exploration of the district in the summer of 1953. No tonnage or grade figures have been revealed as yet on these ore zones, but they are believed to total at least several million tons of lead-zinc-copper sulphides of an average grade somewhat higher than the average of the Brunswick Mining & Smelting Co. ore bodies.

Just east of the area which has produced the four ore bodies the favorable Ordovician formations are unconformably overlain by flat-lying Carboniferous sediments thickening gently to the east at the rate of about 130 ft per mile. Because of the great depths involved and because certain of the Carboniferous formations are rather highly conducting, electrical methods have been abandoned for primary detection of possible base metal ore bodies. The gravimeter, with its great effective depth of penetration, has been used for primary exploration, with only minor success to date.

Electrical Methods

The ground electromagnetic method which has been used most commonly in this area, and which has been responsible for the first three discoveries, is one which employs a vertical transmitting coil, energized by a 1000 cycles per second alternating current and oriented so that its plane passes through the receiving coil position. The receiving coil is tilted to determine the distortion of the primary field caused by subsurface conductors. This distortion is measured in degrees of tilt. From the form of the tilt angle curve one may deduce the position of the subsurface conductors. For steeply dipping conductors the position of the crossover, where the tilt angles change sign, may be taken as the conductor position. Figure 3 shows one of the discovery profiles over the Anacon-Leadridge ore body of the Brunswick Mining and Smelting Co., Ltd. Figure 4 shows a discovery profile over the New Larder U ore body of the Anacon Lead Mines, Ltd. The upper profile on this figure is the electromagnetic profile.

It will be noted that the ore bodies usually give rise to tilt angles exceeding 40° peak-to-peak, since they are strong and large conductors.

Self-Potential Method

Whereas the ground electromagnetic method was responsible for the detection of the first three ore bodies, it would appear that many other electrical methods would have performed the same task. Figure 5 shows a test self-potential profile over the Anacon-Leadridge ore body. The 800 millivolt anomaly is very prominent. It is suspected that part of the anomaly is due to graphite on the hanging wall of the ore body. Figure 6 shows an 1100 millivolt anomaly over the Brunswick ore body.

Resistivity

The resistivity method which has been most widely used in New Bruns-

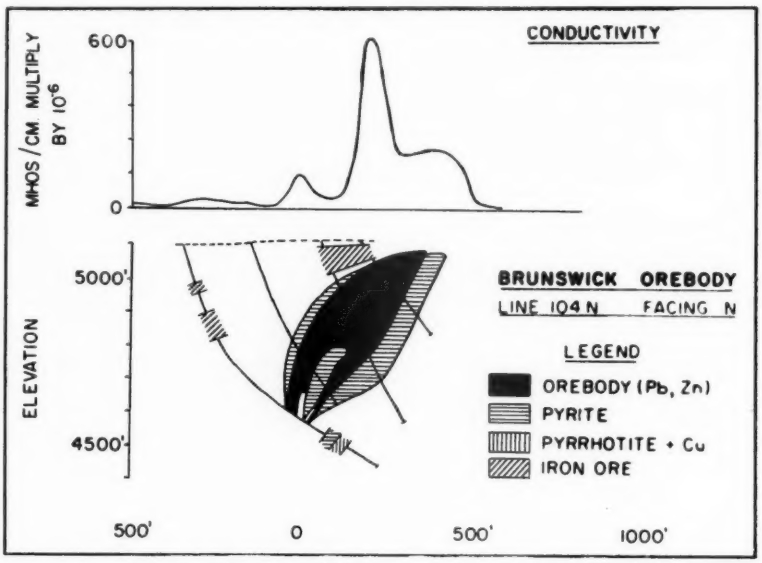


Fig. 7—Resistivity profile across the Brunswick ore body

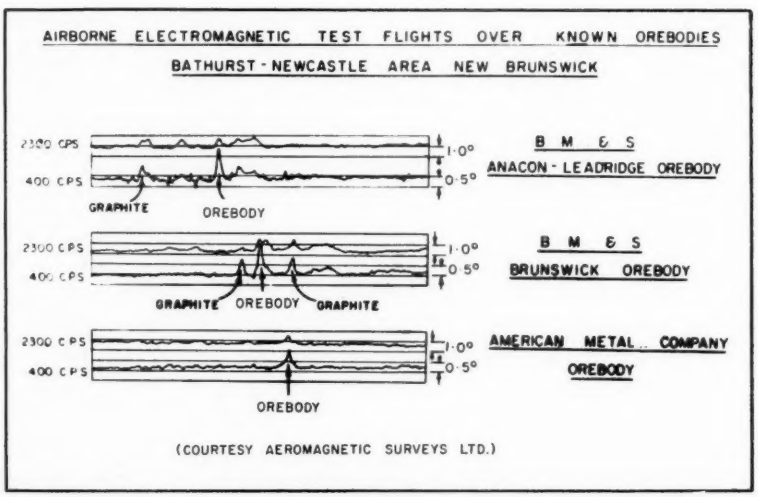


Fig. 8—Traverses over the Anacon-Leadridge, the Brunswick, and the American Metal Co. ore bodies

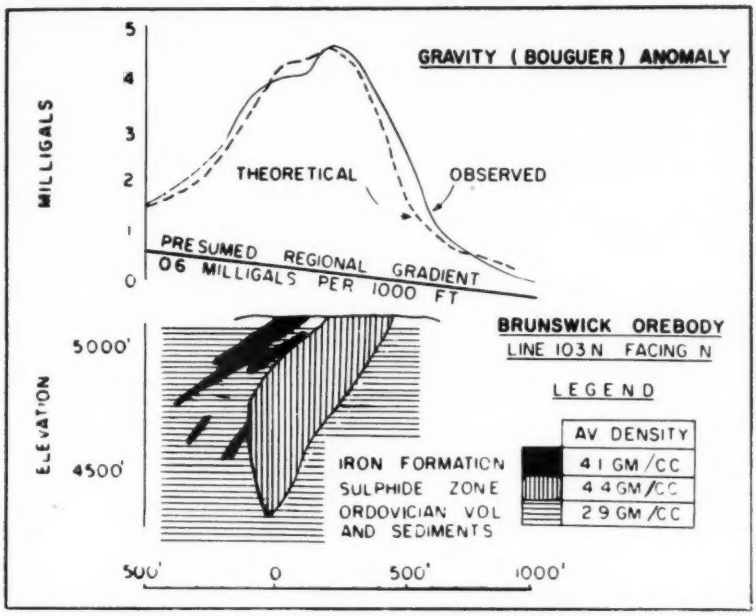


Fig. 9—Gravimeter traverse over a section of the Brunswick ore body

wick (and indeed in Canada) entails the use of a low frequency alternating current (usually 60 cycles per second) which is passed through the ground between contact points one to three miles apart. The line joining the current contact points is usually perpendicular to the regional strike of the formations. Voltage gradient measurements are made along lines also perpendicular to the strike and these are converted by formula to a factor representing the average resistivity of the ground. The normal range of Ordovician rock resistivities is about 5000 to 10,000 ohm meters. Figure 7 shows a resistivity profile across the Brunswick ore body. To emphasize the higher conducting material the conductivity (reciprocal of the resistivity) has been plotted. The ore body is clearly indicated, once again, giving a minimum apparent resistivity of about 16 ohm meters.

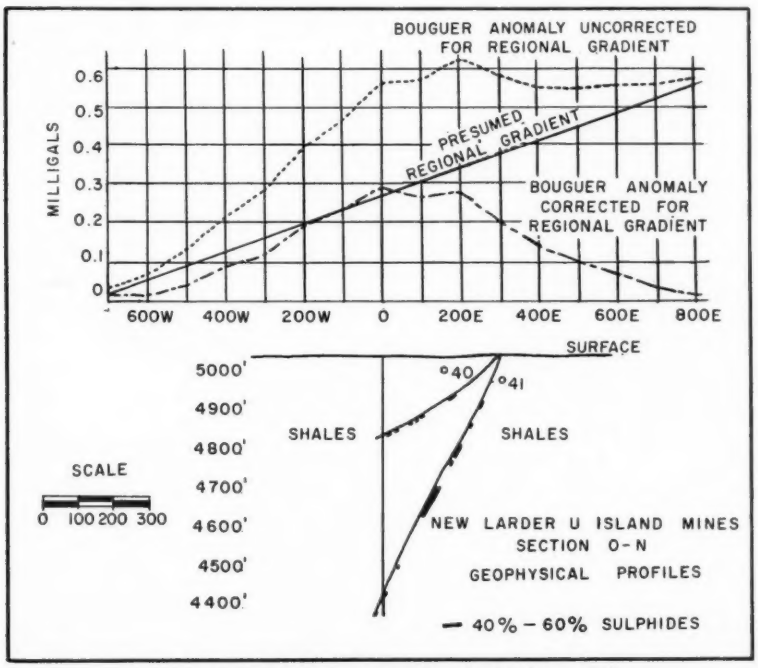


Fig. 10—Gravity profile over the New Larder U ore body

Airborne Electromagnetic

The airborne electromagnetic survey which resulted in the discovery of the American Metal Co. ore zones was carried out by the International Nickel Co. in the summer of 1953 using equipment of their own development. Since the fall of 1954 much additional airborne electromagnetic work has been carried out on a contract basis by Aeromagnetic Surveys, Ltd. The latter equipment is based essentially on certain Finnish developments and operates on a different principal from that of the Inco equipment.

I regret that actual field profiles from the Inco equipment are not available for presentation. However, Figure 8 shows the results of three Aeromagnetic Surveys, Ltd. traverses over the Anacon-Leadridge, the Brunswick and the American Metal Co. ore bodies. The quantity plotted is the phase angle in degrees of the signal received in a drogue drailed behind the aircraft, relative to the field transmitted from the aircraft. This is measured at two frequencies, 400 cycles per second and 2300 cycles per second. A good conductor characteristically gives a smaller phase angle at the higher frequency than at the lower. A poor conductor is emphasized at the higher frequency. This gives some measure of discrimination between good and poor conductors. The mean flight elevation in each case was 500'.

Graphite Problem

Still referring to Figure 8 we can see, in the case of the Anacon-Leadridge and the Brunswick ore body profiles that there are conductors due to graphite zones which give indications that could readily be due to an ore body of great interest. Certain of the graphite zones are much more highly conducting than the ore bodies, whereas others give electrical indications comparable in every way to important sulphide bodies. Experience has shown that, taking the area as a whole, graphitic conductors exceed those due to sulphide mineralization by more than 200 to one. The use of the gravimeter and analysis of soil samples has become widespread in the attempt to differentiate between graphitic and sulphide sources of conductors. Figure 9 shows a gravimeter traverse over a section of the Brunswick ore body. The observed anomaly of about 4.5 milligals magnitude matches the theoretically calculated anomaly based on an ore density of 4.4 g per cc and a host rock density of about 2.9 g per cc. Figure 10 shows a gravity profile over the New Larder U ore body. The observed anomaly amounts to about 0.6 milligals, which is still about ten times the probable error of an individual reading. Figure 11 show a gravity traverse across two parallel graphite zones. Less

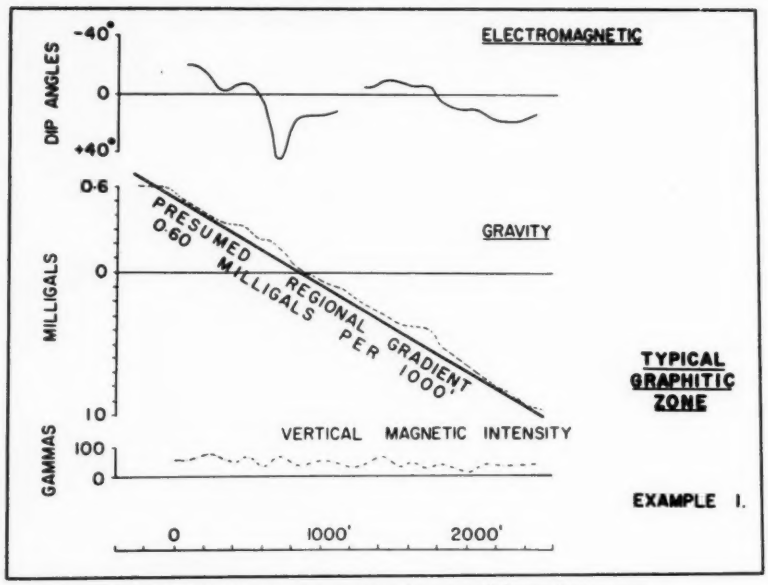


Fig. 11—Gravity traverse across two parallel graphite zones

than 0.1 milligals positive anomaly is associated with each of these conductors. Figure 12 shows a gravity traverse across another strong conductor of graphitic origin.

Since much of the soil here is residual or at least has not been transported very far, geochemical analysis of soil samples has been of value in a positive sense in indicating that certain conductors are associated with base metal mineralization. It has been less reliable in indicating conductors due to graphite, particularly in the presence of scattered mineralization. A good example of its indication of base metal mineralization associated with a conductor may be seen in Figure 13. Note how the glacial movement, which is to the right in the illustration, has shifted the lead geochemical peak some 400 ft from the sub-outcrop of the ore body. Figure 14 shows a section across two adjacent conductors, one of which is the Anacon Leadridge ore body and the second is a graphite zone. Note that the electrical indications due to the graphite are stronger than those due to the sulphide zone. The lead analysis peaks sharply about 100 ft to the east of the sulphide zone. This may be taken as differentiating the two conductors as to origin. However, in view of the shift experienced on the next section to the north (Figure 13) perhaps the resolution is not as clearly cut as it may seem. Figure 15 shows how high lead and zinc analysis were obtained in the vicinity of the Brunswick ore body. Figure 12 shows a strong graphitic conductor on which the gravimeter profile indicated no appreciable sulphide mineralization but on which a strong copper-zinc anomaly was observed in the soil. It was later found that the copper-zinc mineralization originated elsewhere and was concentrated over the conductor because of surface drainage.

It might be asked whether the magnetometer proved to be of much use in discriminating graphitic from sulphide conductors, especially since most of the ore bodies contain some pyrrhotite. This was tried early in the exploration sequence and the answer is that the method is unreliable. Figure 4 shows a prominent magnetic anomaly over one section of the New Larder U ore body. Figure 5, however, shows that no appreciable magnetic anomaly is visible over one section of the Anacon-Leadridge body. Figure 11 shows the corresponding lack of magnetic relief over two graphitic zones.

We conclude that the magnetic method is of uncertain value in either a negative or a positive sense in discriminating between sulphide and graphitic conductors.

Carboniferous Problem

The exploration sequence which has been discussed up to this point was developed for that portion of the area where the Ordovician formations are

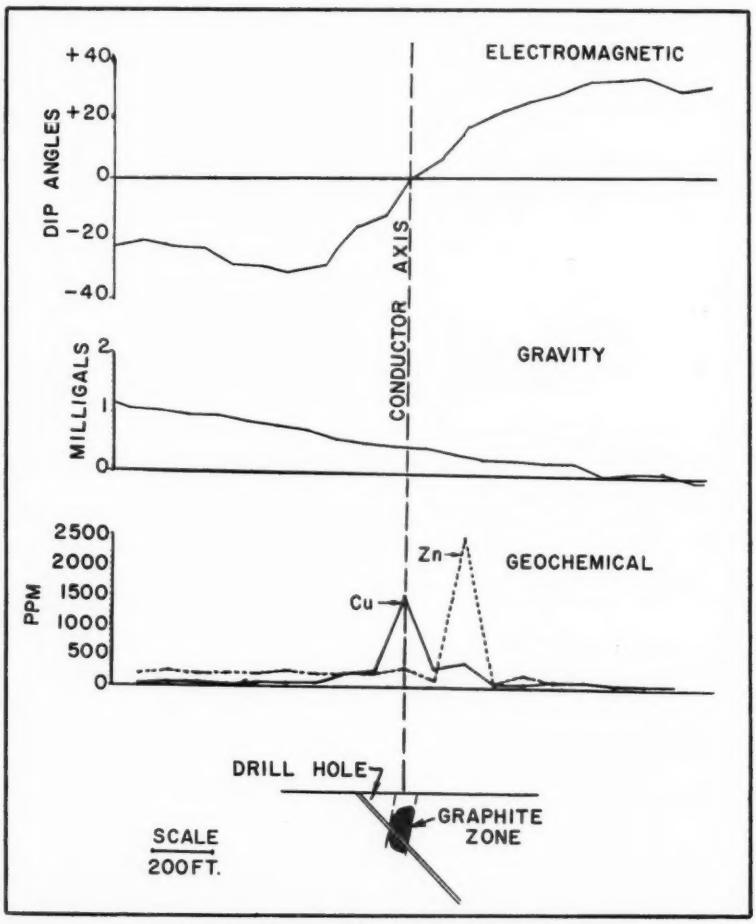


Fig. 12—Strong conductor of graphitic origin

covered by a thin layer of overburden, usually less than 20 ft in thickness. A few miles to the east of the ore bodies the Ordovician surface dips gently eastward at about 130 ft per mile under a flat lying mantle of Carboniferous sediments. These sediments are post-mineralization. Certain members of the Carboniferous sediments are rather highly conducting and render the application of the normal electromagnetic methods very difficult. Moreover the rapidly increasing depth to the potentially mineralized formations makes the application of any of the electrical methods of limited value.

In this Carboniferous covered area the gravimeter has been employed with some success in locating zones of sulphide mineralization in the underlying Ordovician formations. Figure 16 shows the mineralized zone detected by the gravimeter on a property of Mayburn Mines Limited, under approximately 600 ft of Carboniferous sediments. The mineralization in this case was sub-ore grade and consisted in a wide body of about five percent pyrite and pyrrhotite in heavily altered Ordovician sediments. The residual gravity anomaly over this mineralized zone amounted to about 0.5 milligals in peak magnitude.

Acknowledgments

The author wishes to acknowledge the contribution of time and material which has been made by many individuals and organizations and which has made this paper possible. Numerous mining companies have generously permitted data on their properties to be published. The writer particularly wishes to acknowledge the assistance and cooperation of Dr. S. H. Ward of McPhar Geophysics, Ltd. in compiling much of the information. Thanks are also due to Sharpe Geophysical Surveys, Ltd. who gave considerable assistance in the preparation of illustrations.

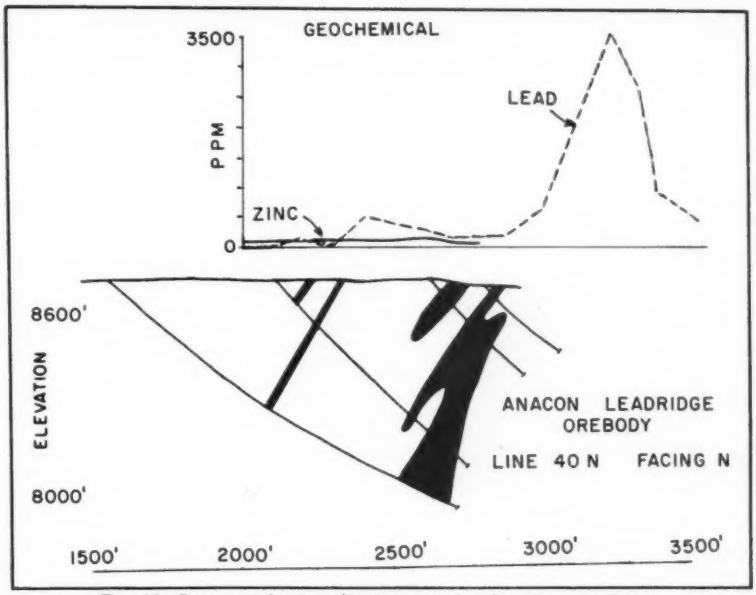


Fig. 13—Base metal mineralization associated with a conductor

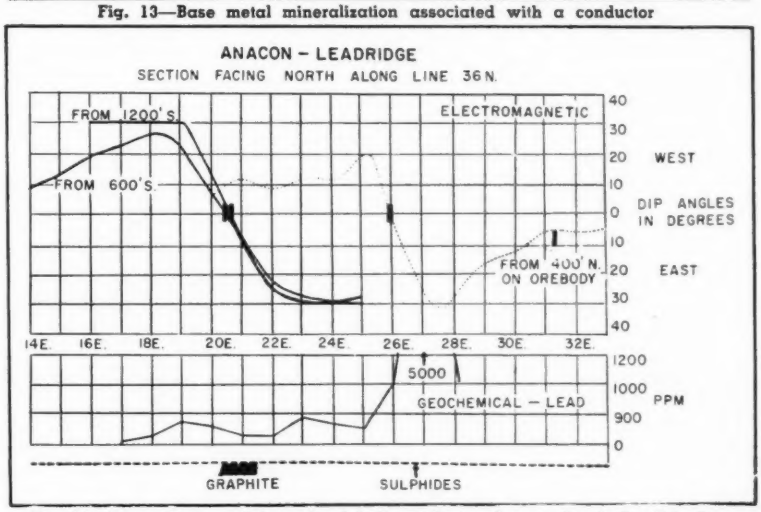


Fig. 14—Separating graphite and sulphide conductors by geochemical soil testing

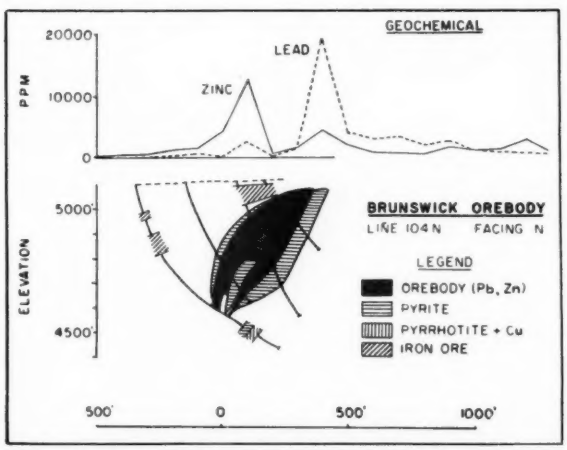


Fig. 15—Chart showing how high lead and zinc analysis was obtained in the vicinity of the Brunswick ore body

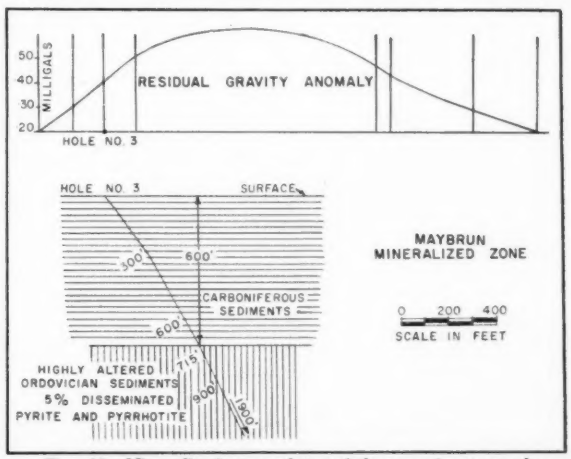
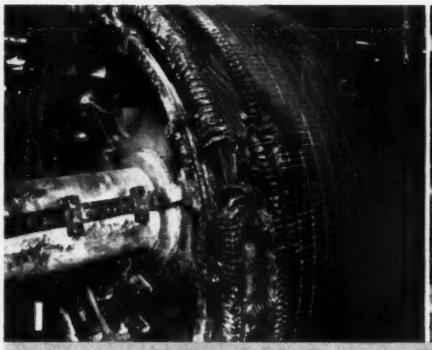


Fig. 16—Mineralized zone detected by gravimeter under 600 ft of carboniferous sediments

Rewinding a Mine Hoist Motor

. . . a typical page from the casebook of National service to the mining industry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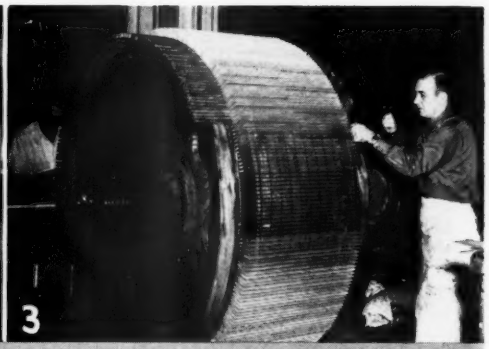
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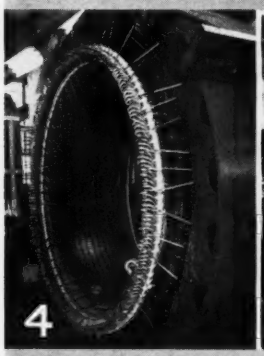
When this reversing mine hoist motor failed, its owners asked National to redesign and rewind it for maximum increase in horsepower.

Figure 1 shows rotor damage from a short circuit caused by a loose bolt within the laminations. Consequential damage to the stator is shown in Figure 2.

Work done on this machine included partial restacking of laminations on the rotor core, partial replacement of finger plates, complete rewinding of both rotor and stator and encapsulation of rotor clips to prevent relative movement, to insulate them and to protect them from corrosion.

Figure 3 shows installation of the new rotor winding on the repaired core and Figure 4 shows the stator winding prior to connecting.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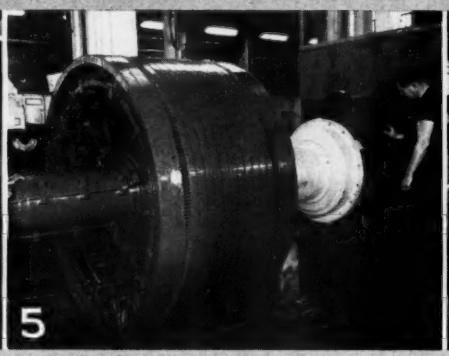
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7

Dynamic balancing of rotating elements after rewinding, standard procedure at National, is illustrated in Figure 5. Figures 6 and 7 show the rewound rotor and stator ready for return to the mine.

Looks a little different — and it is, too. By redesign of inductors, use of new insulating materials and other improvements, National engineers increased the capacity of the motor from 2500 to 3200 HP.

Unusual case? No, just a typical example of what National can do. That's why you should invite your nearby National field engineer to tell you all about National services — why you should think of National first when you have a problem with any large rotating electrical equipment.

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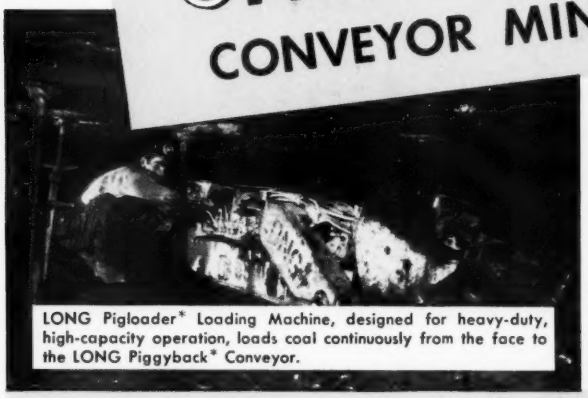
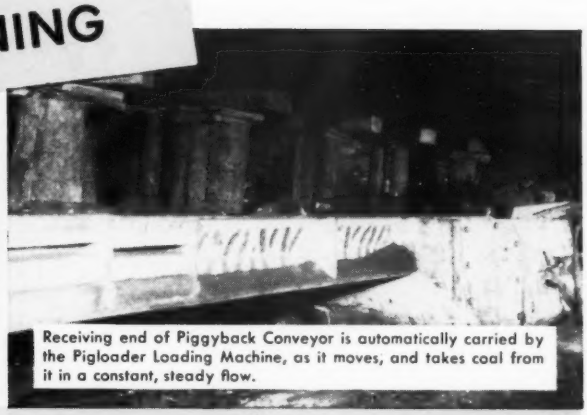
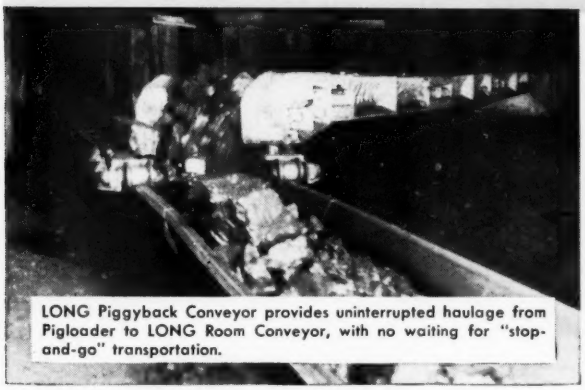


LONG Pigloader* Loading Machine, designed for heavy-duty, high-capacity operation, loads coal continuously from the face to the LONG Piggyback* Conveyor.

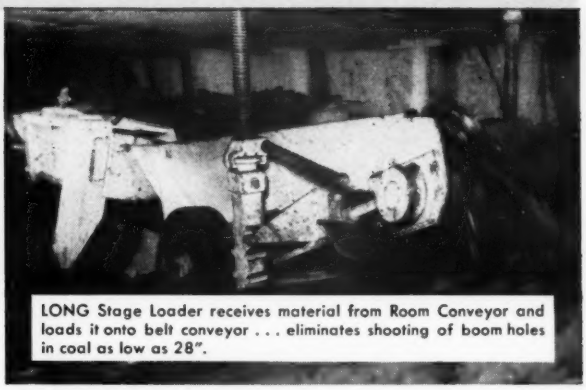


Receiving end of Piggyback Conveyor is automatically carried by the Pigloader Loading Machine, as it moves, and takes coal from it in a constant, steady flow.

Production boosted from 12 to 42 TPM with LONG Continuous-Haulage System



LONG Piggyback Conveyor provides uninterrupted haulage from Pigloader to LONG Room Conveyor, with no waiting for "stop-and-go" transportation.



LONG Stage Loader receives material from Room Conveyor and loads it onto belt conveyor . . . eliminates shooting of boom holes in coal as low as 28".

At this Kentucky mine, a six-man crew, utilizing the LONG Piggyback System in 36"-42" coal, is consistently producing 42 tons per man-shift (conveyor moves included). Prior to the installation of LONG equipment, production at this operation averaged out to only 12 tpm!

Results like these are typical with Piggyback Conveyor Mining. That's because this exclusive LONG development makes possible continuous transportation from the face to the outside. There are no delays whatsoever for car or buggy changes. In fact, with low-investment, low-maintenance Piggyback Continuous Haulage Mining, six hours or more loading time per shift is not unusual. If you would like more information on today's fastest growing method of mining, write us.

For details or a demonstration, write us today!

*Trade Marks

The LONG Company
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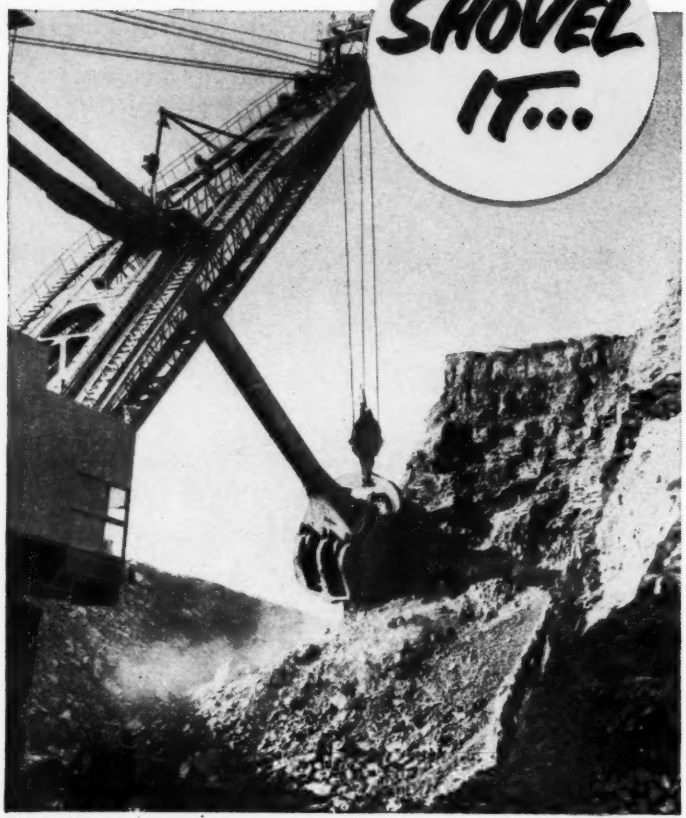
Developers and exclusive manufacturers of the Piggyback Conveyor System—America's fastest growing method of mining.

WHETHER YOU SHOVEL IT...



Dipper hoist ropes take a beating from abrasion, shock loads and constant bending. That is why you need a rope that's engineered for the job — Tiger Brand.

DRAG IT...

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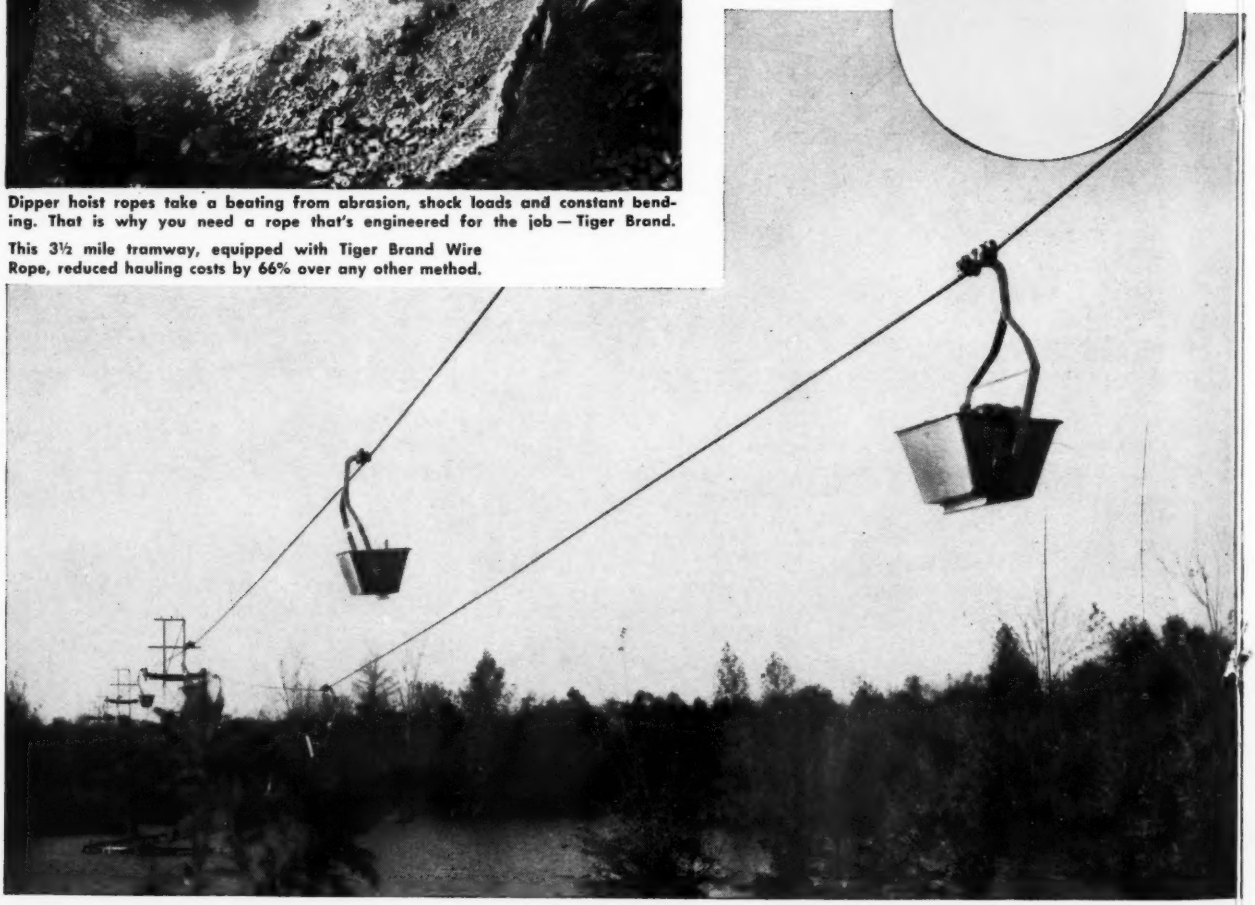
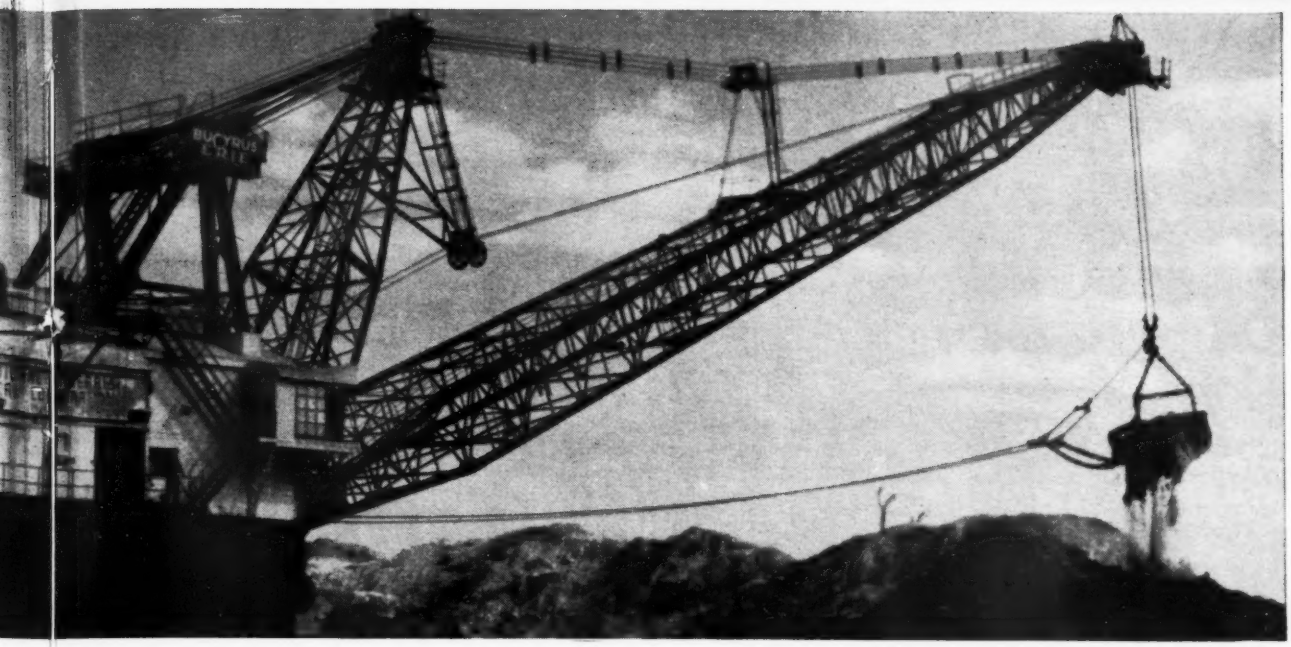


This 3½ mile tramway, equipped with Tiger Brand Wire Rope, reduced hauling costs by 66% over any other method.



Tiger Brand Drag Lines have a reputation for keeping costs down by moving more cubic yards per rope.

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3961-A

Frame Grounding Protection

On August 1 Federal Mine Inspectors Will Again Cite Coal Mine Operators Who Have Not Protected Mining Equipment with Frame Grounding or Provided Equivalent Protection

By GEORGE W. SALL

NOW that a device has satisfied the Bureau of Mines as giving "equivalent protection" and is available to mine operators, the Bureau has announced it will lift its moratorium on grounding requirements. On February 2, 1956, they issued a memorandum which reads in part: "An acceptable ground-fault protective device has now been developed and is available to the industry, therefore, effective as of August 1, 1956, the foregoing order (the November 30, 1953, moratorium on grounding requirements) is rescinded. On and after that date all off-track electric face equipment not provided with means for maintaining their frames at ground potential, or with an acceptable device that will disconnect power from the equipment in event of a ground fault shall be cited in violation of Article VIII, Sec. 5b of the Federal Mine Safety Code or of Sec. 209 (f) (1) of P. L. 552, whichever is applicable. If permissible equipment in a gassy mine is involved, such devices must be certified and enclosed in an explosion-proof compartment. However, where the mine operator can show he had on order as of August 1, 1956, acceptable protection equipment, a reasonable time should be allowed for its receipt and installation of such equipment."

Events Leading Up to Action

"Metallic frames, casings, and other enclosures of the electrical equipment that can become alive through failure of insulation or by contact with energized parts shall be grounded effectively or equivalent protection shall be provided." That is how Article VIII, section 5B of the Federal Mine Safety Code for Bituminous Coal and Lignite Mines of the United States enacted October 8, 1953 reads. It was a paragraph that raised a most controversial question in connection with requirements for permissibility of mechanical coal mining equipment. The point was what constituted "equivalent protection."

Actually, the rule quoted above is a revision of a paragraph covering the same topic in the original issue of the Federal Mine Safety Code dated July 24, 1946. At that time machine frame grounding was covered as follows: "Mining equipment mounted on rubber tires or caterpiller treads, receiving power through a trailing cable, purchased after the effective date of this code, shall be grounded effectively." With this statement there was no alternative. There was only one way to comply, that was to have a conductor connect the frame of the machine to ground.

Introduction of the "equivalent protection" clause was designed to allow other methods of protection to be used. Initially it was thought that the only grounding worthy of the name was actual frame grounding. However, experience has proved that the grounding wire is not always kept intact.

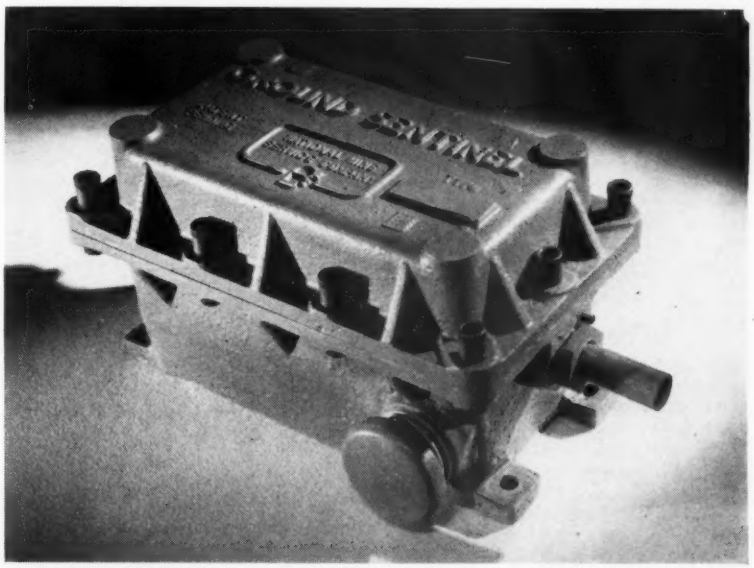
One argument commonly advanced in favor of frame grounding is the fact that the protection is always present. With the frame of a machine connected to ground by an electrical conductor, the moment the machine becomes charged, that charge is carried to ground through the grounding wire—thus insuring against shock or possibly ignition.

Another feature of grounding is that, in addition to protecting the machine, protection can be given the trailing cable. The danger of starting a mine fire or explosion by having a cable short out and explode is very real. With the grounding wire in a trailing cable, a path to ground is made available at any place the cable might short out. To do this, however, the cable must be protected with a fast operating circuit breaker with ground trip relay — the instant the ground wire is involved in any cable failure which causes it to carry a pre-determined current to ground, the breaker trips.

Ground wire protection is only good though when the grounding cable is intact.

Grounding Problems

With the advent of off-track mining in recent years—before that time mechanical mining equipment was generally track-mounted and was grounded through the rails of the mine track—cable manufacturers were the first to face the problem of grounding mobile equipment — especially shuttle cars. They attacked the problem by building a three-conductor cable, the third conductor being the grounding wire. It was necessary, however, to keep the cable diameter to a minimum so that it would have sufficient flexibility



The Ground Sentinel is the first ground fault protective device certified by the Bureau of Mines.

With the advent of off-track mining the problem of frame grounding became more acute.

to be handled by reels, and so that the storage capacity of cable reels would not be appreciably reduced. All of this, of course, while maintaining adequate insulation around each conductor.

To meet these requirements, and an additional requirement of the U. S. Bureau of Mines that the ground conductor have at least 50 percent of the cross-sectional area of the power conductors, the twin parallel cable with a rectangular shaped ground cable between the two power conductors was developed. It is known to the trade as the twin Type G trailing cable.

A problem with the twin Type G, or three-conductor cable, is how to tell whether or not the grounding cable is intact. If one of the power cables breaks you can tell, because the machine it feeds stops operating. Not so with the ground wire. It performs only during emergencies and if it isn't working then, the machine frame becomes potentially dangerous because it has taken an electrical charge and is looking for a path to ground, whether it be through contact with another machine, in which case there is sparking, or through a miner who touches the machine, in which case there is danger from electric shock.

Ground Testing

A large coal producer in Alabama uses the following procedure to assure that the grounding circuit is intact. Tests are made of the electrical continuity of grounding wires in all trailing cables at the beginning of each shift. To do this a six-volt storage battery and a buzzer are used. A lead from one pole of the battery is connected to a piece of mining equipment. The buzzer is wired into the other lead in series and the second lead connected to a piece of equipment or a water line which, of course, is well grounded. If the buzzer sounds it is apparent that the grounding cable is intact as it carried the current supplied by the six-volt battery. The test is then carried one step further. The buzzer is taken out of the circuit and the safety ground trip relay at the junction box is tested. With the buzzer out of the circuit enough current flows through the ground to trip the relay, cutting power from the machine. With the buzzer in the circuit, the current flow is reduced enough to keep the safety relay from operating.

Splices Often Defective

Cable manufacturers have come a long way in designing their three-conductor cables so they will stand the rough treatment received in mine service. However, they have no control over the way repair splices are made. It is not uncommon to omit the splice in the grounding conductor in order to save time and reduce the diameter at the splice. This causes an open circuit in the grounding conductor which destroys intended protection. The frequency with which this situation occurred according to a leading cable repairer ranged from 10 to 28 percent of the temporary splices examined over a three-month period.

It was noted that the temporary splices having the neatest external appearance were most likely to have an unspliced ground conductor.

Moratorium Issued

The U. S. Bureau of Mines on November 30, 1953, issued a memorandum to all coal mine inspection personnel which read in part as follows:

"Article VIII, Sec. 5b. The Bureau of Mines is conducting intensive research and investigation in an attempt to develop a suitable and practicable device that will be equivalent to the customary method of frame-grounding with a separate grounding conductor, particularly for off-track, self-propelled or portable equipment that is powered through a trailing cable. Pending solution of this problem and until further notice, application of this section of the Code is suspended temporarily with respect to off-track, self-propelled or portable equipment that is powered through a trailing cable. For example, the lack of separate frame-grounding conductors for rubber - tire - mounted equipment will not be cause for citation of a violation of this section of the Code until further notice."

The moratorium on enforcement of the grounding provision of the code, it should be added, applied to use only, and not to design, manufacture or rebuilding of approved equipment.

National Mine Service Co., through its activities in the repair of mining cables and the rebuilding of mining equipment, had been interested for some time in the problem of frame grounding or ground fault protection and among others was invited to direct its efforts toward a solution of that problem. From these efforts evolved a ground fault safety device which was given the designation of Ground Sentinel. One unit was built, and it passed the explosion tests of the Bureau of Mines on June 29, 1954.

At the suggestion of the Bureau of Mines, five additional Sentinels were built for the purpose of field testing in actual service underground. When desirable test locations were determined, the Bureau of Mines granted special permission for the installation at each particular mine selected. The six test units have been in service on loading machines and shuttle cars for periods varying from a few months to over one year. The first one was installed October 4, 1954, on a loading machine and is still in service and reported to be performing satisfactorily.

Device Certified

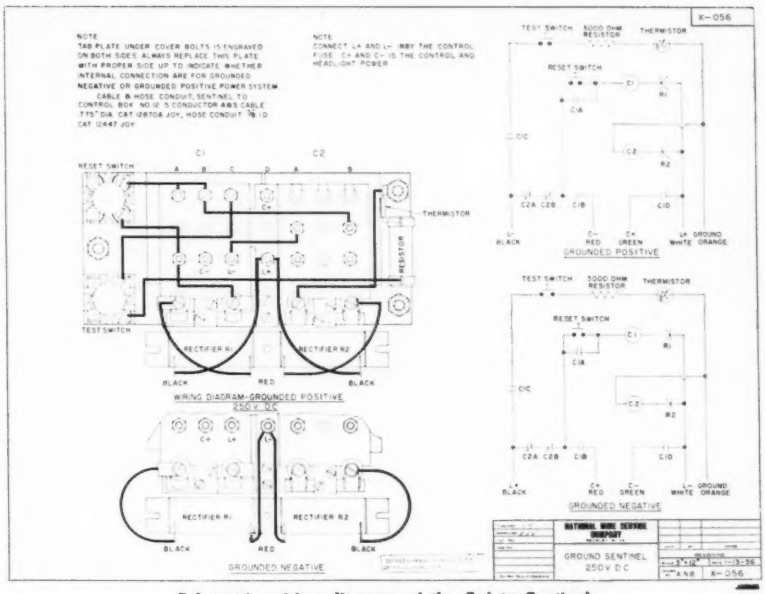
Bureau of Mines schedule 2F, replacing schedule 2E, became effective August 3, 1955. In the new schedule, the requirements for machine frame grounding are stated as follows: "All machines which receive power from an external source and which cannot be considered as being in intimate electrical contact with earth shall be provided with means for maintaining their frames at ground potential, or with a device, enclosed in an explosion-proof compartment, that will disconnect power from the equipment in event of a ground fault." Under these provisions, on November 8, 1955, the Bureau of Mines assigned File No.

x/p-700 to the Ground Sentinel and certified it as meeting the explosion-proof requirements of schedule 2F. It can now be used as a component of permissible machines when authorization is obtained from the Branch of Electrical-Mechanical Testing, U. S. Bureau of Mines, by the builder or assembler of the machine. The authorization would simply consist of an extension of the original approval.

This unit is the first ground fault protective device submitted to the Bureau of Mines for certification that has met the explosion-proof requirements of Schedule 2F.

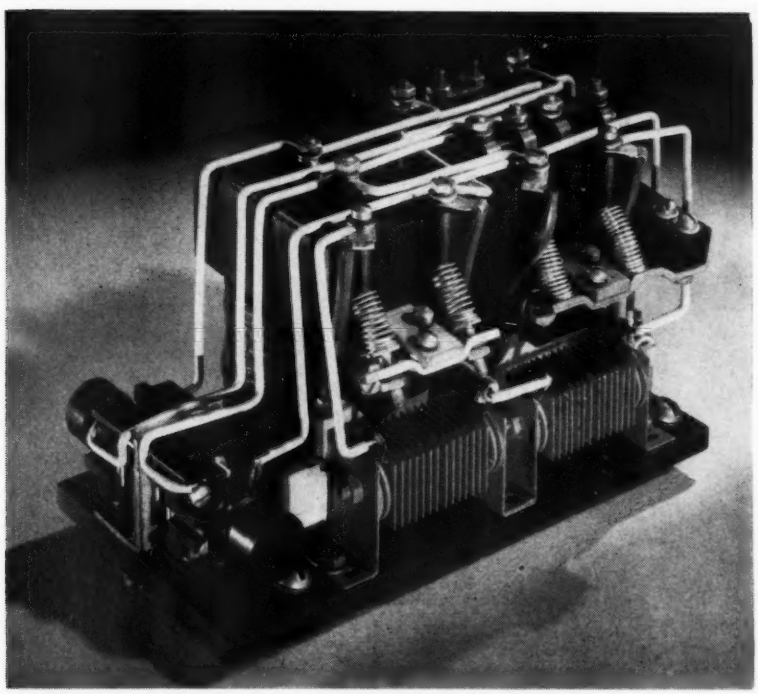
How It Works

The Sentinel is a compact self-contained unit, housed in a cast steel explosion-proof compartment 12½ in. long, 7½ in. wide and 7¼ in. deep. Its electrical components, which are mounted on a panel, consist of a ground fault relay, a control circuit relay, two selenium rectifiers to act as voltage check valves, a reset switch and a test switch in series with which is connected a resistor and a Thermistor. For an explanation of the functions of these various elements refer to the schematic wiring diagram for a grounded negative system. A five-conductor cable is used to connect the Sentinel to the main control box. Two of these conductors connect to the incoming power L+ and L–, two connect to the control and headlight circuit C+ and C–, and the fifth conductor connects to ground. In other words, the unit is connected in series with the control and headlight circuit.



Schematic wiring diagram of the Safety Sentinel.

The first operation is to press the reset switch which closes the circuit from L+ through normally closed contact C2A and C2B, control circuit relay coil C1, selenium rectifier R1 and to L–. This energizes relay coil C1 which closes circuit holding contact C1A, the control and headlight circuit contacts; C1B, C1C and C1D. Now there is voltage on the control and headlight circuit and the machine can be operated in the normal manner. Should a ground fault occur, the potential of the frame will be elevated above that of L– and current will flow from the machine frame through coil C2 of the ground fault relay and to rectifier R2 to L–. When the value of this current reaches 41 to 42 milli-amperes the ground fault relay operates, opening the normally closed contacts C2A and C2B. This de-energizes relay coil C1 causing its contacts C1A, C1B, C1C and C1D to open and remove voltage from the control and the headlight circuit and stop the machine. The ground fault relay coil C2 operates at 28 to 34 volts. Therefore, the Ground Sentinel limits the machine frame potential to a maximum of 34 volts and the current capacity to 42 milli-amperes.



The Sentinel removed from its explosion-proof case.

Test Circuit

A test circuit is provided which, in addition to use for testing the Sentinel to determine if it is operating properly, also serves as a means of de-energizing relay coil C1 during prolonged periods of down time, and can be used as a means of stopping the machine in an emergency. To test, the control circuit must first be energized by depressing the reset switch. Now if the test switch is closed, a circuit will be established through the Thermistor and the resistor to the machine frame, then through coil C2 and rectifier R2 to L–, causing the control circuit to open as described previously. The voltage applied to the machine frame is limited by the Thermistor and resistor. The Thermistor has high resistance at low temperature and low

Because complete failure of the insulation is not required to cause the Sentinel to operate, it is felt that electrical damage can be reduced.

resistance at elevated temperature. Its purpose is to eliminate the possibility of a voltage surge to the machine frame which could be caused by the inductive reactance of coil C2. The Thermistor causes the voltage to increase gradually in such a manner that it does not rise above the value required to operate coil C2.

Should a power failure occur, the control circuit relay opens and the reset switch must be depressed before the machine can be operated. The Sentinel is polarized and will not allow the machine to operate if the polarity of the trailing cable is reversed. In other words, if L– becomes L+, rectifier R2 prevents voltage from being applied to the machine frame, and rectifier R1 prevents the energizing of coil C1 in the control circuit relay.

The foregoing explanation applies to the unit connected for a grounded negative power system. Referring to the schematic diagram for a grounded positive power system, it will be noted that the only changes within the Sentinel itself are the reversal in direction of rectifiers R1 and R2 thus reversing polarity of the power and control leads.

The Ground Sentinel is in effect a continuous resistance monitor. When installed on off-track mining machines, it continuously measures the resistance of the insulation while the machine is in operation, and in the event the resistance level falls below a predetermined value, it will operate to disconnect control and headlight power, thus shutting down the machine and protecting the operator against the hazard of electric shock.

Because of the fact that a complete failure of the insulation is not required to cause the Sentinel to function, it will in many cases forecast that weak insulation exists; thus the point of weak insulation can be located by the usual methods and corrected before a complete failure and short circuit occurs resulting in damage to the machine.

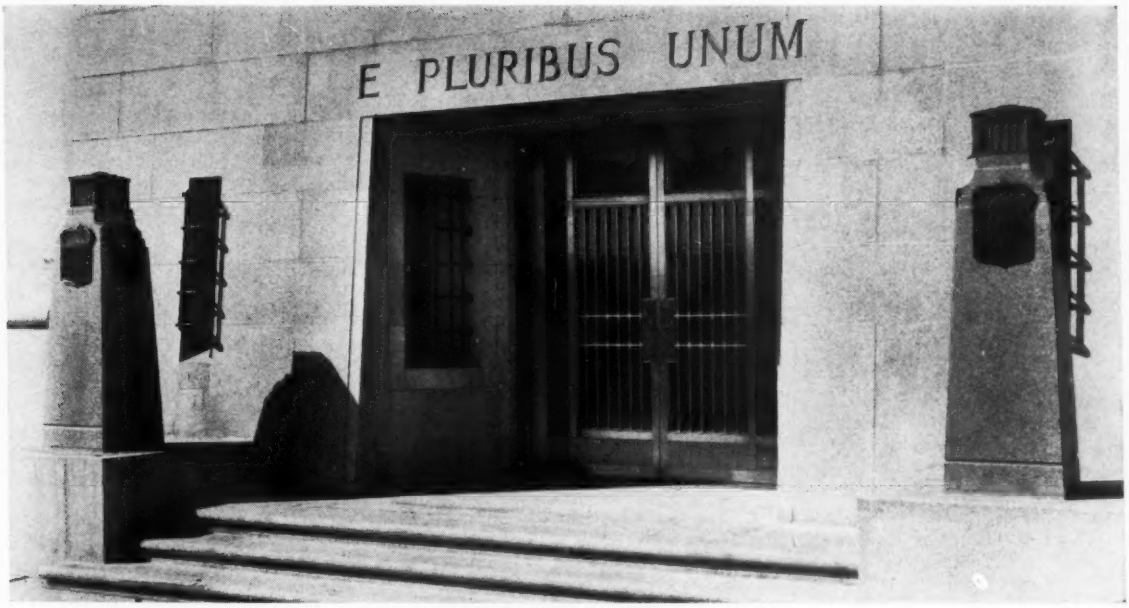
Field Experience

In operation the Sentinel has been effective—too effective some would say. During the month it was used on a loading machine in a West Virginia mine, the unit operated on 12 to 14 ground faults in the machine. These were isolated and corrected. However, a number of operations of the Ground Sentinel were caused by stray currents—some because of contact between the loading machine and a shuttle car while others were reported as being caused by stray currents in the earth. One of the functions of any ground fault protection device, of course, is to protect against the difference of potential between the frames of two pieces of equipment. If a difference does exist, when the two machines touch there is a possibility of arcing which in turn could cause a fire or explosion. Therefore, when the Ground Sentinel was set into operation by stray currents caused by a contact between the loading machine and shuttle car it was doing one of the jobs it was designed for—actually a job it would have to do to give "equivalent protection."

Operation of the unit by stray earth currents could be a nuisance, of course, but would indicate an abnormal situation which should be investigated.

Another West Virginia coal operator has reported that the device satisfactorily answers their need for "equivalent protection." In addition, they feel that because the unit will operate before complete failure of insulation on the machine they will save money in the long run by the knowledge of potential damage to the electrical system should a ground fault occur.

Differences between potential on two machine frames can cause arcing with serious secondary effects.



The San Francisco Mint

Silver In 1955

Move to Repeal Silver Purchase Statutes Receives Scant Support at Committee Hearings—Production Is Steady; Markets Are Vigorous

By ELMER E. JOHNSTON
President
Silver Dollar Mining Co.

SEVERAL significant developments in silver occurred in the past year. Most important of all the market demand for silver was stronger than it has been for many years, boosting the price to 92¼¢ an oz on October 11, 1955, the highest level attained since 1920. New legislative moves were initiated to wipe out the silver purchase statutes enacted during the past 22 years. Many new industrial uses for silver and increased demand in established uses were in evidence during the year. The demand for silver coinage continues to remain at a high level, consuming substantial amounts of Treasury stocks. Imports of ore and base bullion and refined bullion were slightly lower than in 1954. United States silver production increased slightly over the previous year.

In February 1955 Italy exempted silver and gold coins as well as gold in various forms from transfer tax and customs duties. A couple of months later Italy abolished the three percent sales tax on silver and gold coins.

The movement of silver from Russia into the London market has reportedly been reduced to a trickle. Russian offerings in London were generally small and occasional. Observers feel that this reduction in silver traffic compared to late 1953 and early 1954, when substantial offerings were made in both silver and gold, was due to an improvement in the Russian balance of payments picture. Top level changes in the Russian Government in the past year eliminating the freer-trade-with-the-West ideas of Malenkov were also considered a factor in decreased offerings of silver from that country.

Silver Hearings

One of the most important events affecting the interests of domestic silver miners in 1955 were hearings held in July (and continued briefly in January 1956) by the Subcommittee on Federal Reserve of the Senate Banking and Currency Committee on the bill (S. 1427) to repeal certain legislation relating to the purchase of silver, and for other purposes. This legislation was introduced by Senator Green and five other Senators from New England silver-using States and Senator Douglas of Illinois.

A letter signed by the 30 members of the Conference of Western Senators under date of June 29, 1955, and addressed to Hon. J. W. Fulbright, Chairman, Senate Committee on Banking and Currency, urged that the hearings be postponed indefinitely because of inadequate advance notice and the difficulties involved in rounding up the many silver producers throughout the Rocky Mountain States who desired to oppose the enactment of the bill and of the excessive expense and inconvenience that would be imposed on them incident to their appearance before the subcommittee. This letter also stated that no useful purpose would be served by the repeal of our silver purchase laws. This senatorial group is co-chairmaned by Senator Wallace F. Bennett of Utah and Senator James E. Murray of Montana.

Witnesses from the silver-using industries testified that the silver purchase laws were unnecessary, unsound and a burden to the monetary system of the United States. Since opponents of this measure—principally from our Western copper-lead-zinc producing states—did not have sufficient time to prepare testimony and make the trip to Washington following the appearance of the proponents and before the adjournment of the first session of the 84th Congress, plans were agreed upon to conclude the hearings

some time in January 1956 and to permit statements in opposition to the bill to be submitted for inclusion in the record not later than January 24. Several western senators, officials of state mining associations and economists began submitting such statements on January 10, 1956. As of the date this article is being written, it is not expected that either further hearings will be held or any action will be taken on this bill and that it will die on the termination of the 84th Congress.

Although this legislation did not receive full consideration by the subcommittee, this activity re-emphasizes the necessity for maintaining a constant vigil by western senators and the industry against whatever recurring moves may be made by those seeking repeal of the silver statutes.

It was somewhat expected that the Federal Reserve Board and Treasury Department might favor repeal of the silver statutes. However, witnesses for these two leading Government agencies did not make any such recommendations. Although Federal Reserve Board Chairman William McC. Martin stated that he personally had always been opposed to the silver purchase laws he said the effects of silver purchases on the Federal Reserve Board's operations were inconsequential. Under Secretary W. Randolph Burgess of the Treasury Department took the position that "The Treasury has operated under the provisions of the present legislation for a period of years and has found no serious difficulty in so doing, without untoward economic effect, either inflationary or deflationary." He showed that the silver so acquired did not cost the Treasury anything, but resulted in a large profit. The Commerce Department, which is headed by Secretary Sinclair Weeks, former president of Reed and Barton, one of the world's largest silver fabricators, much to the surprise of western senators took a disinterested view and failed to support the repeal bill. The disclosure of this department's position was eagerly awaited by the western senators since the secretary took an active part in 1946 in the hearings on similar legislation conducted by the Senate Committee on Appropriations.

Strong opposition to repeal came from the Department of the Interior. Assistant Secretary of the Interior Felix Wormser warned that enactment of S. 1427 might have a very damaging effect on the economy of certain vital segments of our domestic metal mining industry.

It is significant that this first real drive to repeal the silver purchase statutes enacted since 1933 developed only a matter of months after the death of Senator Pat McCarran of Nevada, long an outstanding champion of domestic silver miners. Apparently the silver users felt that with Senator McCarran's passing it would be easier to repeal this legislation. If this was their thought then they failed to realize that the determination to defend the silver statutes is just as much in evidence today as at any time in the past.

Production

Silver production in the United States in 1955 totaled 36,734,565* oz. This compares with 36,582,288 oz produced in 1954, or an increase of less than one percent. The production by States was as follows:

States east of the Mississippi	159,038
Missouri	438,000
Western States:	
Arizona	4,723,000
California	910,702
Colorado	2,800,000
Idaho	13,978,990
Montana	5,835,700
Nevada	826,788
New Mexico	231,700
Oregon	6,750
South Dakota	154,700
Texas	27
Utah	6,213,000
Washington	422,350
Wyoming	16
Alaska	33,804
Total	36,734,565*

* Preliminary; Source: Bureau of Mines

World silver production totaled approximately 205,000,000 oz in 1955 or a decrease of 1.8 percent as compared with the 208,700,000 oz produced in 1954.

Silver Market

Silver in the New York market reached its highest point in 35 years in October of 1955, with a price of 92¼¢ per oz. Not since 1920 when the market price reached $1.38 per oz has such a high level been attained. The year's low was 85¼¢ which prevailed the first two and a half months of the year.

On March 15, 1955, the price rose from 85¼¢ to 89¾¢ an oz, an increase of 4½¢. This was the first material change in the market price of silver in over two years. Although pressure had been exerted on supplies through an increased industrial demand for silver, the primary reason for the abrupt increase was the withdrawal of the Bank of Mexico as a supplier. The Bank had made many other commitments for silver, among them being a coinage order for 17,200,000 oz from Saudi Arabia early in the year.

The New York price equaled or exceeded the Treasury buying price for domestic silver of 90½¢ per oz on at least three different occasions during the year. In May the market price reached 90½¢; in September after slight fluctuations in the intervening months the price went to 91¾¢ and on October 11 reached 92¼¢. The year's high was attained because of the continuing tight supply situation and the lack of prompt delivery at refineries. After the new high was reached the price fluctuated narrowly for the remainder of the year and on December 31 stood at 90½¢ per oz.

The London market followed the trends in the New York price but was characterized by a continued independence on day-to-day transactions, as was also noticed in 1954.

Treasury Acquisitions And Sales

In July of last year silver users found it necessary to resort to the buying of silver from the United States Treasury on a large scale. Consumers became hard pressed because of the annual demand for silver required for the fall and holiday trade together with the fact that a majority of the refineries were closed down due to strikes. Total purchases of silver from the Treasury for industrial uses during 1955 amounted to 10,289,403 oz, the largest amount of silver sold by the Treasury for industrial uses since World War II.

The United States Treasury acquired 22,921,971.21 oz of silver in 1955, all from domestic production.

The United States mint in the previous year minted 50,825,550.95 oz of silver into subsidiary coins, and as of December 31, 1954, there were left on hand 34,549,447.5 oz, which, together with a lesser amount minted last year, were sufficient to meet the subsidiary coinage demand in 1955 and leave a small surplus of subsidiary coinage on hand December 30, 1955, of 11,288,256.3 oz. A strong demand for subsidiary coinage continued. The mint, on orders from other countries, also coined 4,066,322 oz into foreign coin.

Silver in the general fund carried as seigniorage amounted to 24,926,862.9 oz by the end of the year as compared to 13,549,447.5 oz on January 1, 1955. The increase in seigniorage silver is due to the return by the Netherlands of 23,168,589 oz of lend-lease silver and 6,876,591 oz which accrued to the Government as profit during the year on acquisitions of domestically-mined silver. The volume of seigniorage silver has been declining steadily in recent years due to the demands for coinage beyond the amounts acquired from domestic mines.

Lend-Lease Silver

The Netherlands in 1954 and 1955 returned 23,168,589 oz of lend-lease silver, the second debtor country to begin repayment of its silver lend-lease debt. Belgium had previously repaid its silver lend-lease debt in full, in the amount of 261,333 oz.

The balance yet to be returned by the Netherlands is 33,568,752 oz and the total amount outstanding as of

December 31, 1955, was 387,384,422 oz.

The unpaid balance of silver lend-lease indebtedness to the United States follows:

Australia	11,773,093
England (United Kingdom)	88,073,878
Ethiopia	5,425,000
Fiji	196,364
India	225,999,904
Netherlands	33,568,752
Saudi Arabia	22,347,431
Total	387,384,422

The Treasury has decided to place all lend-lease silver returned in the so-called seigniorage fund to be made available for coinage purposes and for sale to industry as long as the Silver Act of 1946 is on the statute books.

Industrial Consumption

A strong industrial demand for silver was in evidence throughout the year. This was a primary cause for the firm price situation which resulted in exceeding the Treasury buying figure of 90½¢ an oz on at least three different occasions during the year.

This bright market picture is due principally to greater demand from the industrial arts for silver and for the many new industrial uses that have developed in recent years. Generally, the high level of demand is due to the prosperous condition of the nation's business during 1955, the defense program playing a major role. There is every indication that these conditions will continue into 1956 and that silver will share in this vigorous business activity.

Many new industrial uses were reported for silver in the nation's press during the past year. Here is a partial list:

1. A new lens duct using silver coated aluminum bars is now available from Westinghouse Electric Corp. The silver coated bars, 35 percent lighter than their copper counterpart, provide low resistance contacts as joints.

2. A new process is reportedly being used for joining sintered metal parts and low temperature silver-brazing alloys. This new process has resulted in substantial savings in material and labor costs for metal fabricators.

3. Silver is one of the most effective metals used in reprocessing atomic fuels. Silver helps to remove the "ashes" caused by heating uranium above its melting point.

4. The I-T-E Circuit Breaker Co. reports a new circuit breaker providing short circuit current protection up to 100,000 rms amp using silver and quartz in the fuse element.

5. A new general purpose aircraft wire able to withstand extremely high and low temperature conditions in jet aircraft operation—developed by Electric Auto-Lite Co.—uses a silver plated copper conductor as its "heart." Flexibility is maintained at temperatures ranging from minus 80° F to 400° F at 40,000 ft and higher.

All of these uses add up to a continued strong industrial demand for silver. One source reports that sales of sterling silver tableware today are over 600 percent above pre-World War II levels. According to an article in the April 1955 issue of *Coronet Magazine* entitled "Silver Magic," the silver tableware industry has sold more sterling pieces in the last decade than in the entire previous period of American history. This would indicate that future demand in the old line uses for silver would go far toward creating a bouyant silver market even without the growth in new uses.

Silver in India

The low consumption of silver in India of around 3,000,000 oz was attributable to the continued ban on imports and to the privilege now accorded farmers to buy the land they cultivate. This land reform movement has to some degree diverted the farmers' attention from the age-old custom of hoarding silver. This change is also reflected in the market price range of silver in Bombay. The Bombay market reached a high of 176 rupees nine annas per hundred tolas (98.75¢ per oz) on November 28, 1955. The low for the year was the equivalent of 85.75¢ per oz reached on January 6.

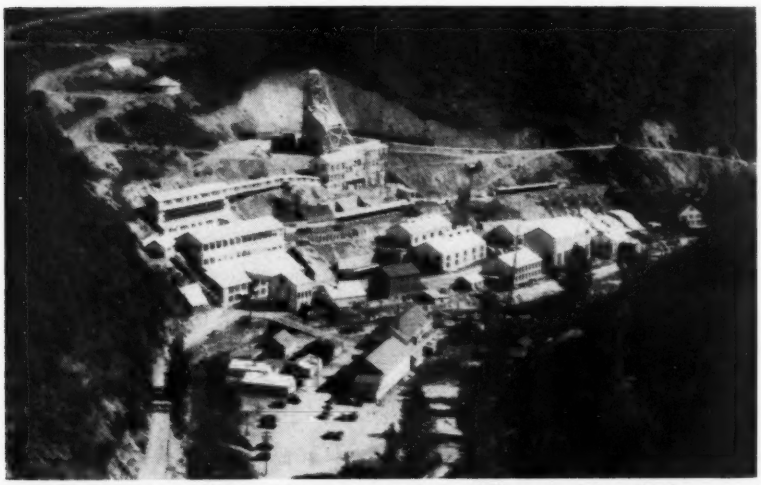
Silver coining at the Philadelphia mint

The Indian Government refinery which has been under construction for the past two years is expected to be completed in 1956, after which the repayment of India's silver lend-lease debt to the United States should begin. The original purpose in building this plant was to extract silver from coins withdrawn from circulation for repayment to the United States of the Indian lend-lease debt. To date no Indian silver has been returned although the Indians reportedly have 300,000,000 oz which is more than enough to discharge their obligation totaling 225,999,903.83 oz.

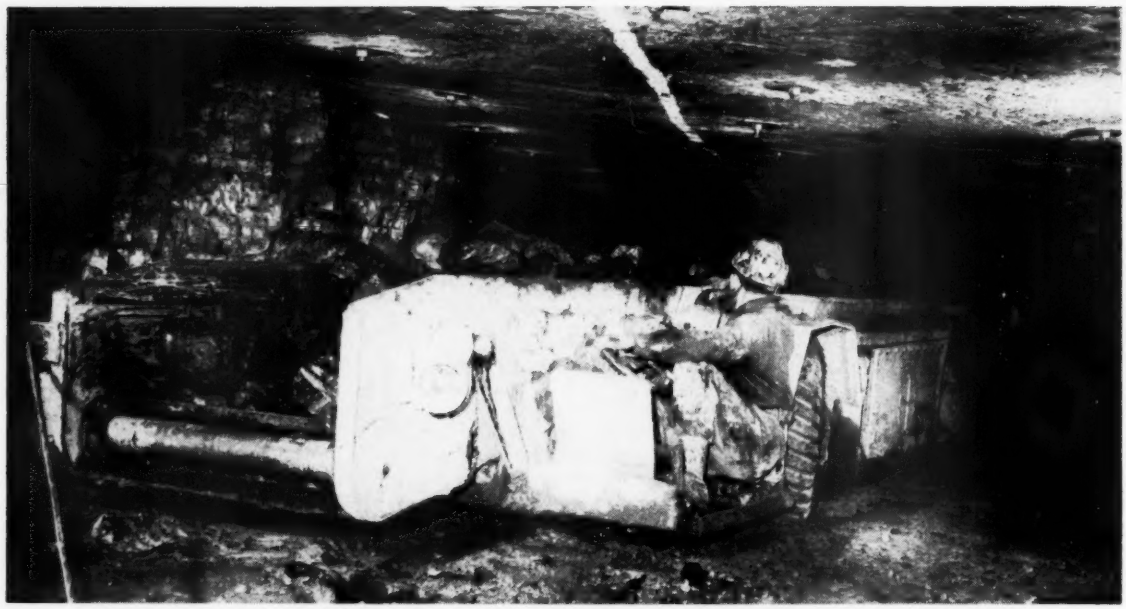
A change is reportedly being considered in the Indian currency system. The country is going to introduce a decimal coinage and standard weights and measures system. The rupee is to remain the currency unit but will be divided into cents instead of 16 annas as at present.

It is to be expected that the demand for silver coinage and industrial silver in the United States, Great Britain, Mexico, Western Germany and Saudi Arabia, in particular, as well as other European and South American countries will continue on a high level and in all probability the 1956 demand will exceed that of 1955.

When will the silver miner get the price for his product he deserves?



An important silver producer in the Coeur d'Alene lead-zinc district



Short hauls and the availability of two separate travelways are musts for efficient shuttle car application

Face Transportation For Mechanical Loading

A Joint Report by Three Committees of the Coal Division — Mechanical Mining, Rail Haulage and Conveyor Haulage—Showing the Application of Shuttle Cars, Conveyors, and Mine Cars for Service Haulage

Compiled by STEPHEN KRICKOVIC

AS more continuous mining machines are put into service, there will be an increasing tendency to think of conventional mining as an outmoded and expensive method in our highly competitive industry. This thought would be equivalent to saying that the present conventional equipment and methods are being operated at peak efficiencies, or that no performance by them is good enough. We all know that neither is the case generally.

We also know that the present continuous mining machines are not economically applicable to all mining conditions, that large scale conversion to continuous mining will require considerable time and that conventional equipment, therefore, is to stay with us long enough to deserve more attention than it has ever received. It is with this thought that the Committees on Mechanical Mining, Conveyor Haulage and Track Haulage undertook the task of obtaining, studying and reporting on the various methods of face transportation actually in use with conventional loaders. The purpose of each report is to present the important physical conditions, the equipment and the plan of mining used and the results obtained, which all can be a possible guide for improvement.

Summary

Essential facts from each report are summarized in table I. It would be well to elaborate somewhat on certain items as follows:

(1) In all the thin seams reported on, crawler mounted loaders are used under tops that vary from good to bad and on bottoms that range from firm fireclays to soft fireclays and shales which soften when wet.

In order to obtain maximum clearance in these thinner seams, bolts, posts and two in. thick headers with one to three bolts and legs on either end are commonly used.

It is undoubtedly correct to say that bolting has revolutionized mining in the thinner seams by making practical the use of crawler mounted loaders, bridge conveyors and shuttle cars.

(2) In the thinner seams, which are mildly gaseous, the number of working places per loader generally is small—two to four. These places, however, vary from 16 to 28 ft wide in the headings and 35 to 40 ft in rooms. It is this extra width, compared to the 13 to 24 ft width in the gaseous Pittsburgh seam, that provides some compensation for the few places. Less time is required by the crew in walking and in tramming the equipment, and more time is thus available for effective work.

By contrast, mines in the Pittsburgh seam have 18 working places per loader in Mine F, and seven to eight pillar places in Mines G and

H. Incidentally, partial mining is practiced in all the thin seam mines and full recovery in the thick seams. Although not mentioned in the reports, the larger number of working places would be based on the desire to have enough cuts shot down, in addition to the one being loaded out, to eliminate delays from gas accumulation and from some unusual seam and top conditions. In short it can be said generally that the proponents of larger number of working places per loader believe that the machine will thus be kept busy in coal.

(3) In shuttle car operation, the two very important factors are short distances from the faces to the unloading point and the availability of two separate travelways between the working faces and the unloading point. This means that particular care should be exercised in designing a plan of mining and that belt conveyor or mine car loading stations should be moved at relatively short intervals. Some operators insist on 150 to 180-ft intervals measured along the room heading. In other mines, this distance is 240 to 270 ft, and the reason is that the cost of preparing the necessary clearance and of roof support, particularly in the thinner seams, and of laying track at shorter intervals cannot be justified. Let's theorize a bit on this point.

If, for instance, the loading station in Mine G was moved every 180 ft rather than every 270 ft, the man shifts required for extending the track and moving the loading station would be roughly 45 for every 76 shifts, or say $1000 compared to $700. With the 22,000 tons involved per 76 shifts of production, the extra cost of $300 is equivalent to $0.014 per ton. However, the shorter distance between loading stations will reduce the shuttle car travel by 180 ft per round trip—750 to 580 ft—and will reduce the time required to haul the 70 shuttle cars by roughly 45 minutes, using three mph as average speed of travel. This extra time could be used to increase the production by roughly nine shuttle car loads or 35 tons, which, on the basis of 70 shuttle cars, 290 tons and 23 tons per man, is equivalent to a reduction of $0.10 per ton in face cost.

The point about the need for short hauls and two travelways is particularly significant in shuttle car operation, because there exists in the system an appreciable inherent delay of change-out. According to the reports, the actual change-out time averages 55 seconds. If half of this time is used in effective work by the loader, and half is waste, the loss of time per shift of 90 cars is about 45 minutes or roughly 12 percent of the face time.

It is interesting to note that the time lost in face haulage with the track mounted loaders in Mine F is comparable to that in Mine D, 38 to 50-in. seam with shuttle cars discharging on belts, and Mine G, seven-ft seam with shuttle cars discharging directly into mine cars. It would be a good guess that the short haul is responsible for the most part.

(4) Bridge conveyors, chain conveyors and room heading belt conveyors comprise an effective and practical method of continuous face transportation. While the use of these facilities is not necessarily determined by the top and bottom conditions, weak tops and soft bottoms are good reasons for considering the conveyors to permit closer timbering outby the face and to prevent bogging down of the shuttle cars.

The further point about the conveyor system is that all of the shuttle car delay time is eliminated, and this time is converted into productive work of extending or retracting conveyors and of other steps in the face cycle.

It is noteworthy, in this respect, that the three mines using bridge, chain and belt conveyors have a better face performance than all the others, except Mine H.

(5) The facts about direct loading into mine cars, as listed for mines F and I, indicate that the performance is comparable to that in all other set-ups, except in very thin seams. While probably many factors are responsible for this, adequate numbers of working places, short gathering haulage distance and large mine cars have undoubtedly contributed much to the performance.

As to the two track equipment mines, Mine I appears to have the more difficult physical conditions in the cloddy roof that cannot be bolted, in the soft bottom and in the very high rejects, and Mine F has a more difficult mining set-up in that full recovery is practiced.

Special loading devices have made it practical to transfer coal from shuttle car to belt in relatively thin seams

Conclusions

Roof bolting has made it possible to use conventional loaders in the thinner seams.

Short shuttle car hauls and two travelways wherever practical are musts for good performances. Bridge, chain and belt conveyors in 33 to 50-in. seams of coal can make possible performances that will equal and at times surpass the average performance with shuttle cars in the thick seams.

Potential performance in the thick Pittsburgh seam of coal with conventional loaders is considerably in excess of the average obtained at present.

Following are the committee reports, covering mining operations with the several types of gathering haulage.

Mechanical Loading with Shuttle Cars to Mine Cars

MINE "A". The seam mined is the upper Cedar Grove which has a thickness of 42 in. Mining conditions are favorable—three percent maximum grades, good top and water is no problem. Roof support is with three methods depending on conditions (1) Bolts providing 24-ft horizontal clearance and 42-in. vertical clearance. (2) Wood headers with bolts giving 24-ft side clearance and wood headers with posts giving 13-ft side clearance, vertical clearance 40 in. The support methods have no adverse effect on haulage.

Summary of Pertinent Facts in Reports on Face Transportation from Conventional Loaders

MINES

	A	B	C	D	E	F	G	H	I
Seam	Cedar Grove	Coalburg	Powellton	Hernshaw	Elkhorn #3	Pittsburgh	Pittsburgh	Pittsburgh	Pittsburgh
Thickness Mined	42″	42″–66″	42″	38″–50″	33″–38″	90″	84″	84″	54″
Roof	Good	Hard Slate & Sandstone	Shale & Drawrock	Soft to Hard Shale & Sandstone	Thin Layers Shale & Coal—Bad	Average	Top Coal, Drawrock Rooster Coal	Head Coal & Hard Gray Shale	Drawrock & Colloidal Material
Floor	Good	—	Soft Fireclay	Usually Soft Shale	—	Hard Fireclay	A weak Slate. Hard Fireclay	2″ Hard Fireclay underlaid with soft fireclay	Soft Fireclay
Water Conditions	No Problem	No Problem	—	Bottom wet and soft occasionally	No Problem	No Problem	Average	Relatively Dry	Extremely Wet
Grades	3% Max.	—	—	0–4% Av. 1.75%	—	Occasional rolls and dips	Local Dips 1% to 2%	Generally Level	—
Type Roof Support: Posts	Yes	Yes	Yes	Yes	Yes, and Safety Jacks	Yes	Yes	Yes	Yes
Headers with Posts	Yes	Yes	No	No	No	Yes	Yes	No	Yes and Hitched
Headers with Bolts	Yes	No	No	Yes	No	No	No	No	No
Headers with Posts and Bolts	Yes	No	No	Yes	No	No	No	No	No
Bolts	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No
Width of Places	24′	20′ hdgs. 40′ rooms	—	16′–18′ hdgs. 35′ rooms	28′ hdgs. 40′ rooms	13′ hdgs. 18′ lifts	16′ hdgs. & rooms 24′ lifts	16′ rooms 15′ pillar lifts	12′ hdgs. 20′ rooms
Vertical Clearance	40″ under Headers	—	—	42″	—	6′ Min.	6′	6′–6″	5′–2″
Horizontal Clearance	13′	—	—	12′	—	10.5′	11′	15′	12′
Face Equipment: Cat. Mounted Loaders	Yes	Yes	Yes	Yes	Yes	—	Yes	Yes	—
Track Mounted Loaders	—	—	—	—	—	Yes	—	—	Yes
Shuttle Cars	Cable 2.2T	—	—	Cable 1.5T	—	—	Battery & Cable 4T & 6T	Cable 6T	—
Bridge Conveyors	—	Yes	Yes	—	Yes	—	—	—	—
Chain Conveyors	—	Yes	Yes	—	Yes	—	—	—	—
Locomotives	—	—	—	—	—	Yes	—	—	8 ton
Mine Cars	6 ton	—	—	—	—	10 ton	3.5 ton	—	10 ton
Belt Conveyors	—	30″ wide	30″ wide	30″ wide	30″ wide	—	—	30″ wide	—
Belt Loading Device	—	Chain Conveyor	—	Chain Conveyor	—	—	—	—	—
Method of Unloading from Face Haulage	Shuttle cars into mine cars	—	—	Shuttle to conveyor Feeder	—	—	Snuttle cars into mine cars	Shuttle cars on belt	—
Number Working Places	—	2	3	3–4	3	18	5 hdgs. 7–8 pillars	7	5
Av. Length Gathering Haulage-Round Trip	600′	—	—	560′	—	440′	750′	240′ min. 840′ max.	800′ max.
Type Mining: Full Recovery	—	—	—	—	—	Yes	Yes	Yes	—
Partial Recovery	Yes	Yes	Yes	Yes	Yes	—	—	—	Yes
Loading Pt. Moves: Man Shifts	—	—	—	3 every 180′ of belt*	—	—	—	—	—
Belt Conveyor	—	—	—	—	—	—	—	—	—
Mine Car	2 Every 14 Shifts*	—	—	—	—	—	30 every 76 shifts	—	—
Face Haulage Delays—Minutes per Shift: Shuttle Car Change	112	—	—	70	—	—	82	21 min. 90 max.	—
Mine Car Change	—	—	—	—	—	41	—	—	—
Mine Car Trip Change	10	—	—	—	—	30	—	—	—

(Continued on next page)

MINES

	A	B	C	D	E	F	G	H	I
Seam	Cedar Grove	Coalburg	Powellton	Hernshaw	Elkhorn ±3	Pittsburgh	Pittsburgh	Pittsburgh	Pittsburgh
Percentage of Available Face Time Loader: Operates per shift	168 mins.	—	—	41%	—	—	35%	85%	—
Face Performance:									
Machine Shift Tons—Raw	202	Peak: 350 hdgs. 475 rms.	—	275	—	360	310	—	550
Machine Shift Tons—Clean	—	Peak: 315 hdgs. 427 rms.	1250 total per day	220	200 rooms	277	290	550	350
Tons per face man—clean coal	—	Peak: 52.5 hdgs. 95 rooms	9.3 on payroll	20.0	26.6	21.3	23.0	50	25

* Does not include extending track.

The mine is worked on the room and pillar system. Tractor mounted mechanical loader discharges into cable reel shuttle cars of 2.2 tons capacity. The shuttles discharge from ramps directly into 6-ton mine cars. Two shuttle cars are used with each loading unit making a total of 92 round trips producing 202 tons per shift. The average length of the round trip haul is 600 ft.

The machine averages two hours and 48 minutes actual loading time per shift. Delays at the machine for the shuttle cars changes amount to a total of one hour and 52 minutes per shift. There is also ten minutes delay time due to mine car changes at the loading point. The mine car loading point is moved ahead once every 14 working shifts. This move requires two hours and 30 minutes.

Mechanical Loading with Bridge and Chain Conveyors

MINE "B". This report describes a mechanical loading operation in the Coalburg seam which ranges from 42 to 66 in. The immediate roof varies from a hard slate to sandstone. In some instances, 4 by 8 in. by 16-ft headers were set on two-ft centers in bad top areas. Generally, seam conditions are good. The mine runs from wet to dry but water is not a serious problem.

Two places, either 20-ft entries or 40-ft rooms, are worked per set-up. One place is being prepared while the other is being loaded out. A crawler mounted loading machine equipped with a special boom loads the coal from the face onto a bridge conveyor, which passes it to chain conveyor which in turn discharges the coal onto a 30-in. belt. Undercutting is with shortwalls tractor mounted; hand held drills are used for drilling.

The face crew is made up of six men plus one foreman as follows:

(1) Loader operator and helper who load coal, set safety and road posts, and tram to next place.

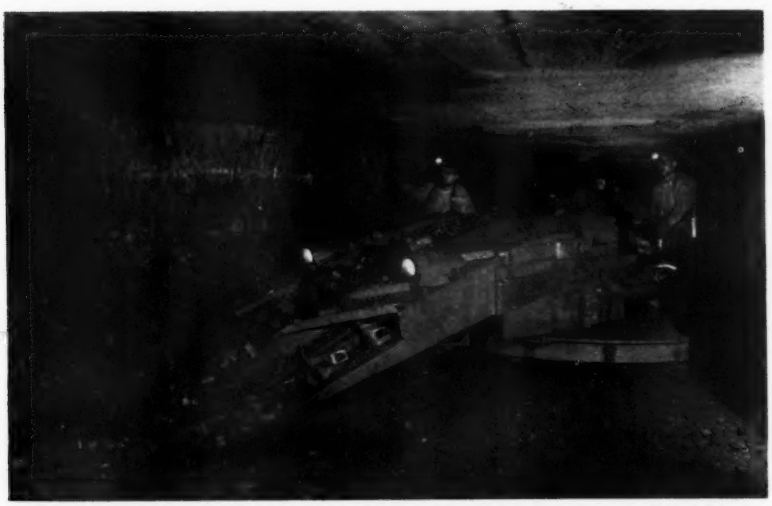
(2) Cutting machine operator and helper who cut, drill and rock-dust face area.

(3) Two utility men who extend chain conveyor, shoot and timber. Moving the conveyors is done on the third shift and takes five man shifts.

In entries, the peak tonnage for a shift with this crew and equipment has been 14 cuts or 350 tons of material. A reject of 10 to 12 percent leaves approximately 315 tons of clean coal. In rooms the peak shift production was 475 tons of material or 427 tons of clean coal. This calculates a peak production per man of 52.5 tons in the headings and 95 in the rooms. Delays attributed to the conveyors have been less than one percent of the delay time, with our over-all delays less than five percent.

MINE "C". The seam mined is the Powellton. A 36-in. section of high quality coal is underlain with about six in. of soft poor quality coal and this in turn is underlain with approximately three in. of soft fireclay. The roof is of shale and draw rock which varies in thickness from 0 to 15 in. This top requires close timbering for support, even after the draw rock comes down. Due to the high ash coal at the bottom of the seam and the underlying fireclay off-track haulage was not considered feasible at this operation. The close timbering required and the low height which did not permit thick cross-bars, were also factors to be considered if track haulage was used.

The system used is to advance three faces with one tractor loader. In the beginning low vein loading machines discharge directly onto chain conveyors. Timbers were set close to the edge of the pan-line on one side and a runway for the loading machine was maintained from the last breakthrough to the face on the opposite side. Transferring the coal directly from the loader to the chain conveyor resulted in considerable spillage. This difficulty was overcome by the installation of bridge conveyors. Wider ribs can be reached and the faces can



Track mounted equipment loading into mine cars is still the answer to certain mining conditions

be advanced a greater distance beyond the tail of the pan-line which affords a saving in pan-up time by permitting the addition of two or more pan-line sections at one time.

Chain conveyors have helped overcome, to some extent, the problems of soft bottom and poor top. Shortwalls skidding over the floor, as well as the crawlers on the loading machine, plow up this bottom and the loose combustible material which has been ground into dust is hauled to the outside when the conveyors are not used for transporting coal to the cleaning plant.

This mine has been operating with belts and chain conveyors for approximately 15 years; loading machines were installed about six years ago. Main line haulage is by 30-in. belt conveyors which transport the coal approximately 2½ miles to the cleaning plant. Supply and personnel transportation is served by rail haulage from a portal approximately one mile from the working area, using battery locomotives and 19 in. high supply cars operating on 30-lb rail. At present, production is 1250 pd. The total number of men employed is 135, giving an average of 9.3 tons per man.

Shuttle Cars to Belt Conveyors

MINE "D". The seam mined is the Hernshaw which has a height of 38-50 in., averaging 45 in. The general dip is 1.75 percent with local variations approximating three to four percent. In general, the mine floor is satisfactory for shuttle haulage but if wet conditions occur at abrupt grade changes, much trouble is encountered requiring either loading out soft material or bridging.

The top is usually soft shale but there is some sandstone. Only posts along ribs are set under sandstone roof with clearance not being a problem. Under shale top, 14-ft headers two to three in. thick are set on 4-ft centers, with a post under each end and with a one in. diameter roof bolt, 30 in. long, placed in the middle of the header. Horizontal clearance between posts is about 12 ft. Roof support does not affect the haulage performance adversely.

Tractor mechanical loaders discharge into shuttles which haul to a 30-in. belt conveyor in the entry. The maximum belt length is 2000 ft. The belt loads into ten-ton mine cars on the main haulage. A chain conveyor with three to four pans is used as a belt feed from the shuttle car. Two shuttles are used with each mechanical loader. These are the cable type three-ton capacity.

The production per machine shift is 175-300 tons of clean coal, average 220 tons. The time available in the section is six hours, 49 minutes. The loader at the face is in operation 41 percent of available time. The usual round trip shuttle car haul varies from 480 to 650 ft, averaging 565 ft. Shuttle car delays average 15 percent to 20 percent of available time. Shuttle car change time is 54 seconds. Moving or extending the loading point is done by special moving crew on 3rd shift; a full shift is needed using three men.

Mechanical Loading onto Bridge and Chain Conveyors

MINE "E". This report describes a mechanical loading operation in the Elkhorn No. 3 seam, which varies from 33 to 38 in. Top conditions are extremely bad, consisting of thin layers of shale and coal extending upward approximately 10 ft. With this roof, wide haulageways would be difficult to keep open. For this reason conveyors were selected for the room haulage.

Mining is with mechanical loaders using bridge and chain conveyors for service haulage from the face to the 30-in. intermediate belt conveyor in the entry. The bridge conveyor is 26 ft long and attaches directly to the end of the loading machine boom. Discharge end of the bridge is supported on the rolled-edge pan of the chain conveyor into which it automatically loads.

Roof bolting has revolutionized mining in thinner seams

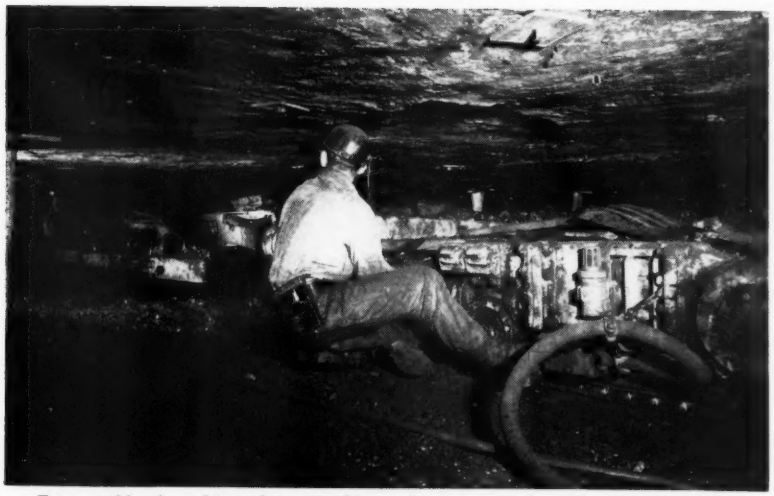
Each working section consists of two places, either 28-ft entries or 40-ft rooms. Equipment for a section consists of a tractor-mounted loading machine, two bridge conveyors, two 420-ft chain conveyors, two shortwall cutting machines, two electric coal drills and one rotary roof drilling and bolting machine. With every cut of coal approximately 6 to 10 bolts are set. Twenty-five safety jacks are used in the immediate face area and 18 posts are set outbye.

A face is loaded out in approximately 25 minutes. This includes all tramming, removing and resetting the 25 safety jacks. Where top conditions permit, the loading machine crew will install roof bolts. Because of the amount of timbering necessary, a cut cannot be prepared in less than 35 minutes, which results in 10 minutes of free time for the loading machine crew. During this time they either install the roof bolts or pan up the chain conveyors for the next cut. The crew employed for one production unit include the following six men; loading machine operator and helper, cutting machine operator and helper, and two utility men. The average tonnage of material in a room operation amounts to about 200 tons per shift.

Mechanical Loading into Mine Cars

MINE "F". This operation uses all-rail haulage from the working face to the outside. Track-mounted machines load directly into ten-ton mine cars. The seam mined is the Pittsburgh, averaging about 90 in. in thickness, topped with 12 in. of draw slate which is mined and loaded with the coal. Adverse grades are not usually encountered but occasionally local rolls and dips prove troublesome. The mine is fairly dry but water is encountered in most areas immediately adjacent to the river. The standard method of roof support is by wood crossbars with bolting in areas where the top is extremely tender and at intersections where a wide area is exposed. A clearance of 6½ ft over the rail is maintained in the main haulage. The seam conditions have not determined or influenced the decision to use track haulage.

Mining is by the block system. Entries are 13 ft wide with the blocks mined retreating by 18-ft lifts after the entry and rooms have been driven to the barrier limit. A block of 18 rooms constitutes a working panel. Service haulage handling the mine cars from the tractor loader is by an eight-ton cable-reel electric locomotive which hauls between the face and sidetracks on the entry. A ten-ton lo-



Extra width of working places in thin coal seams compensates in part for the lack of coal height

comotive handles the intermediate haulage serving two panels and taking trips to the main line sidetrack. Forty mine cars are assigned to a production unit. The average length of the service haul is 220 ft, from the room face to the entry sidetrack.

Track gauge is 44 in. Fifteen-ft lengths of 40-lb rail are used in working places, placed on steel ties; 60-lb track is used on the intermediate haulage roads. The track for mining a complete panel uses 8500 ft of 40-lb rail; 3400 steel ties and 40 room turnouts complete with frogs and switches. About 95 percent of the track material is recovered for re-use.

A unit produces an average shift tonnage of 360 tons, consisting of 277 tons of clean coal and 83 tons of refuse. The total face crew is 12 men of which the haulage crew for one shift is one motorman, one brakeman, and four trackmen. No other labor in a production unit is necessary because track is used.

A typical time study for face loading shows the following delays per shift due to service haulage; out of a total shift time of 6 hours 30 minutes:

Car Change—37 cars @ 1.1 min. each	40.7 min.
Trip Change—5 trips @ 6 min. each	30.0 min.
Cars off track 2 times .	17.0 min.
Spot empties	1.9 min.
Spot loads (6 times) ..	11.5 min.
Broken and dirty track	3.1 min.
Total delay	104.2 min.

Mechanical Loader with Shuttle Cars to Mine Cars

MINE "G". The seam is the Pittsburgh of which seven ft is mined. The seam is generally flat with local dips of one percent to two percent. Fireclay bottom is capped usually with ½ to one in. of hard pan. The floor is generally dry, but when wet it creates a serious haulage problem.

The top has 12 in. of top coal, 12 in. of drawrock, 8 to 10 in. of rooster coal and weak black slate. Roof bolting is used throughout except in pillar lifts.

The loading machine loads into shuttle cars which discharge directly into 3.5-ton mine cars, or in some cases, into an elevating conveyor which in turn loads into mine cars. Shuttles are four-ton battery type or six-ton cable; three cars are used with each mechanical loader. Average round-trip shuttle car haul is 750 ft. Car delays average about 20 percent of availabe time; change time is 62 seconds.

Average production per machine shift is 290 tons of clean coal. The shift time available in section is 6 hours 15 minutes; the loader is in operation 35 percent of available time. Moving or extending the loading point requires 30 man-shifts; this work is done without production interruption.

Mechanical Loading with Shuttles to Belt Conveyors

MINE "H". This report covers a mine located in the Pittsburgh coal seam. The seam in general is level and the mine is relatively dry. Immediate roof is a hard gray shale ranging from 18 to 24 in. in thickness. Approximately six to eight in. of top coal is left to help support the shaley roof; bolts are placed on four-ft centers and six bolts are used for each cut of coal. A false bottom of a hard fireclay, approximately two in. thick, overlays a very soft fireclay that causes considerable trouble if wet conditions are found.

The conventional room and pillar system is used; the rooms are approximately 16 ft wide and are driven on 60-ft centers. Seven places constitute a working panel. Pillars are removed with 15-ft lifts and are brought back on a 45° pillar line.

The crawler mounted mechanical loader discharges into shuttle cars which dump onto a 30-in. panel belt. This belt is extended by a special crew on the third shift. It loads onto a 36-in. main haulage belt that takes the coal to the outside. Two six-ton cable reel shuttle cars are used on each section and the two shuttle car operators are the only regular haulage men on the section crew.

Average production on the section is 550 tons per shift using a total crew of 11 men, of which two are buggy operators. Working time at the face is seven hours and 30 minutes, and the men are rotated for lunch. The loader is operating at the face approximately 85 percent of its available operating time. The average shuttle car change time is one minute for the longest haul, 420 ft, and 15 seconds for the shortest haul, 120 ft. Shuttle car delays average 15 percent of available operating time.

Mechanical Loading into Mine Cars

MINE "I". This operation in Eastern Ohio is fully mechanized, using track-mounted cutting machines, track-mounted loading machine, track-mounted drills and timbering machines and 10-ton capacity steel mine cars. The mine cars are loaded by the machine at the working face, and hauled to the tipple by locomotives, where they dump automatically without uncoupling. A 13-ton trolley-reel locomotive is used for the service haulage and 12 mine cars are assigned to a production unit. A total of 2500 ft of 40-lb rail, 830 steel ties and eight room turn-outs, complete with frogs and switches, are used for mining one block of five rooms; 95 percent of the track material is recovered for re-use.

The seam mined is the Pittsburgh or No. 8, which averages about 54 in. thick. A 12 to 14-in. drawslate falls when the coal is shot, and must either be loaded out or gobbed in the mine. Because the mine is extremely wet, resulting in soft bottoms, and roof is bad, track haulage is used.

Rooms are worked in blocks of five, with each block comprising the territory for one production unit. Coal is hauled by an eight-ton cable-reel locomotive from the face to the intermediate side-track located in the entry; from there a 13-ton relay motor takes trips to the main line. The maximum length of the service haul is 4000 ft from the room face to the entry sidetrack. The face crew has 12 men; of these, three men are employed on haulage—a motorman, brakeman and trackman. This does not include moving and relaying.

A unit produces an average shift tonnage of 550 tons—350 tons of clean coal and 200 tons of reject.

Company Mining Versus Contractor Operation

Open Pit Miners Ponder the Question. Common Interests Outweigh Opposed Interests As Shown in Discussions Representing Both Sides

The Company Viewpoint

By EVERETT L. JOPPA
General Manager of Mines
Pickands Mather & Co.

THE questions of what value contractors have to mining operations to a certain degree depends on the mining area and obviously on the type of mining; therefore, we are confining our observations to open pit mining and to the Lake Superior iron ore operations.

Shift from Rail to Trucks

At the present time, open pit mining is confined to truck haulage, with a small scattering of locomotive hauls. Truck haulage which has allowed contractors to enter into this type of operation, was introduced on the Cuyuna Range in 1937. A review of the activities of the Lake Superior area shows that prior to 1937 all pit haulage was by locomotive and railroad cars—except for a very few isolated scram operations which had used small trucks. From 1937 through 1942 a large number of mines were converted to truck haulage.

Locomotive haulage by a contractor was out of the question if he had to operate in the same area with mining company operations; therefore, not many contracts were entered into unless the contractor could operate alone in an area with a minimum of interference. The advent of large capacity trucks in 1937 and their use in material haulage on much steeper grades over stable roads was quickly recognized as a means of allowing several operations to function efficiently in adjacent areas. By 1942, circumstances developed whereby this was put to use.

During the 1930's, development of ore reserves had been held to a minimum. Although some acceleration in ore shipments took place in the late 30's and early 40's, it was not until after the start of World War II that the lack of development became serious. It also became apparent that additional equipment would be extremely difficult to acquire and that increasing manpower beyond that available in the mining area would be needed. The need for these assets brought additional contractors into the area.

Invited Contractors

Prior to 1942, there were in the area a small number of contractors who filled such needs as developed, but they were not able to take on much additional work above the normal amount which they had been accepting. Many mine operators reviewed their future requirements for movement of surface material, rock and lean ore, allocating to themselves as much as their manpower and equipment would allow, and then hopefully asked outside contractors to bid on their additional needs. This was an

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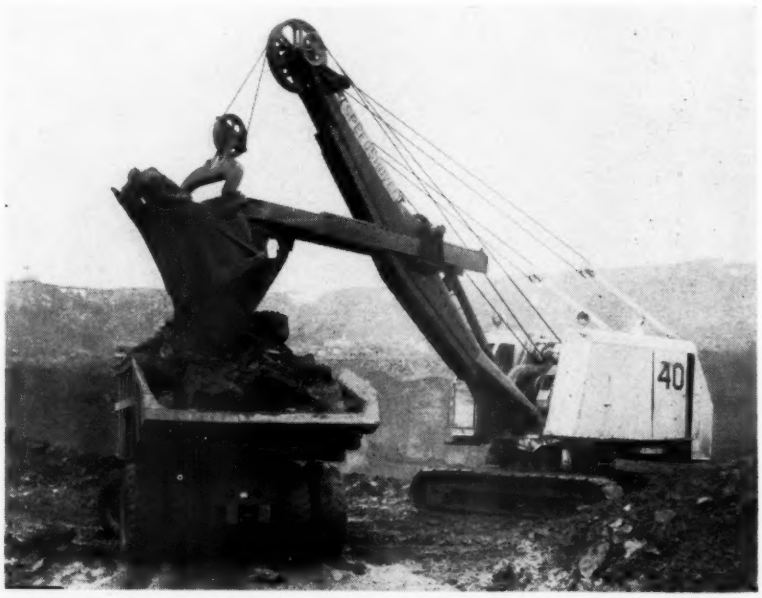

Bottomless muskeg, severe cold and sharp abrasive rock make iron range stripping contracts rugged work

Contractors offer the small operation flexibility by making specialized skills and equipment available

The Contractors' Viewpoint

By JOSEPH W. WELLS
President
Wells Cargo, Inc.

THE use of the contractor in the field of mining is not anything new—since he has been a partner of the miner since time immemorial in both open pit and underground workings. Certainly, the prime objective of every mine operator is to produce his product as cheaply as possible, whether a mine operator does the job himself, or whether he hires a contractor. Like any other field of endeavor in the past years certain groups of contractors have become specialists in open pit mining operations. As time goes on this special group of contractors is becoming more adept in coordinating and conducting their operations to fulfill the requirements of the mining industry. While Wells Cargo conducts its operations primarily in the West, the problems experienced by other contractors are common and this discussion deals primarily with contractors, their work and their relationship with the mine operator.

The prime requisites of a contractor in this group are his ability, his financial stability, his equipment reserve and his contracting know-how to successfully conduct these operations to the satisfaction of the mine operator.

Specialized Skills

Metallic metals have been mined since the beginning of time, but we are now on the threshold of an entirely new era in the nonmetallic field which requires the development of increased specialized skill in open pit mining operations. There are some very successful company-operated properties, and it is the writer's opinion that some of these operations are being conducted in a very efficient manner and at a cost competitive with any contractor's operation. A close study of these company operations reveals that some of these mine operators would have made very successful contractors.

The decision of the mining company as to company or contractual operation is something that can be resolved only by a complete study of the economics of the particular situation. There are advantages and disadvantages which the mine management must weigh and evaluate to determine which type of operation is more basically sound.

Often it is advantageous to pool resources of both the miner and the contractor and work the property jointly, each performing a particular phase of the work. Such joint endeavor and the application of the most modern machinery have made into paying properties many mines that would otherwise have been marginal. By employing this method the mine operator has had the opportunity to utilize the flexibility of a contractor in conjunction with his own workings.

In open pit mining there are certain phases that are common to all, that is the stripping of the overburden, the mining of the waste material, the mining of the ore and the transportation of the ore to the mill for further processing or marketing. In the determination of the feasibility of a mining project it is necessary for the miner to calculate his costs for every phase of the operation. This involves the analysis of his operational problems, which include engineering, mining, processing, the selection of the proper type of equipment to use on each phase, the assimilation of the data of the capital costs involved in the purchase of the machinery, the costs involved in the maintenance and operation and a long range study of his tax structure. These should all contribute to his ultimate decision. These conditions are often accentuated, particularly in the case of the smaller projects where also the selection of the tools for the initial phases of the work might not coincide with the most desirable equipment for some of the later phases of that project, thus necessitating a compromise in equipment application resulting in higher operational costs and eventual curtailment of the end profit.

Guaranteed Price

It is into this picture that the contractor assumes his role. At his disposal he has numerous facilities that he can offer the miner. They are: trained personnel, specialized modern equipment, flexibility of equipment, a high use factor on equipment, plus, what is most important of all, a guaranteed price for the performance of the various items of work. Thus the contractor removes the operational risk from the miner by establishing a known cost factor and eliminating the hazard of the mine operator's projected estimated costs—that may or may not conform to original calculations.

The guaranteed costs that the contractor submits to the mine owner are not the product of any particular kind of witch-craft. They are based purely upon years of experience in operation of the particular type of equipment that he has at his disposal. A good contractor knows which equipment best fits the specified phase of open pit operation, whether it is stripping of overburden, the selective mining of ore and waste, or the complicated problems that can arise in the transportation of the ore due to the rules and regulations and economics that are imposed by regulatory bodies today.

Flexibility

In addition to the guaranteed price that the contractor is proposing for the performance of certain work there are other advantages that he can offer. With the flexibility that he has at his command by virtue of being

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Company Viewpoint

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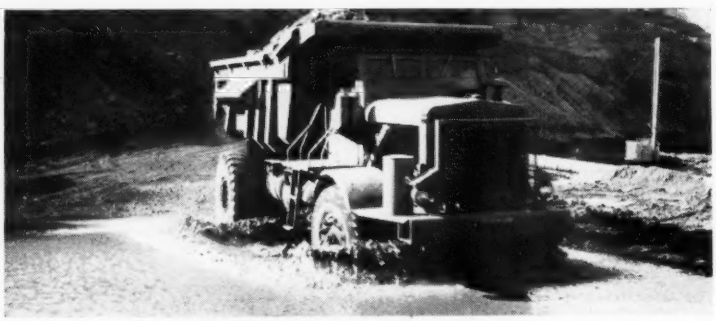
open invitation for outside contractors to enter the area. Many did, and some are now actively engaged on contracts. Others withdrew after the completion of one or more contracts.

You may wonder why some have stayed and others have withdrawn. This is not hard to explain. Many of the contractors entering this area for the first time had had very little experience, if any, in the movement of glacial drift or muskeg. As an example, we recall a contractor who had been invited to bid on the movement of approximately 2,000,000 cu yds of glacial material and who examined the cross-sections and the area itself before putting in a bid. It was also explained to him that a certain water problem existed in the lower development. This particular mine had made an estimate of the cost per yard they expected would be the mine's cost. When the contractor's bid was received, it was roughly $.06 per cu yd below the mine's estimate and $.10 below the next lowest bid.

The mine management, before awarding the contract, approached the low bidder and informed him that they wished he would check his estimate as it was felt he was too low. The result was that the contractor advised the management that he felt that his bid was not out of line, and it was therefore accepted. The contractor lost money. Other contractors had similar experiences.



Flooded roads are hard on equipment

Experience Is Vital

Many of the failures to make a profit were due to lack of experience in the moving of this type of glacial drift, inability to cope successfully with water problems, inability to build and maintain good roads, and last, but certainly not least, a lack of information or understanding of the severe weather conditions in the area. Those contractors now at work in the area had similar difficulties, but, since gaining experience, have found that it is now a profitable undertaking.

Many contracts were let out during the 40's and early 50's—some for small yardages and others which included both stripping yardage and the movement of the ore and lean ore uncovered. Of course, the mine managements were not too happy with some of the bids which they were called on to accept, but as many contractors gained experience in economical operation, the cost per yard has dropped—not to a point equal to the costs of the mine operator, but certainly acceptable when necessity forces management to call for bids on the movement of large volumes.

Labor Considerations

A number of problems have developed through the use of contractors which involve the mine operator, labor union and the contractor. The prevailing union in the Lake Superior area is the United Steelworkers, C.I.O. Where contractors were given contracts on certain work on an active property, the union representing the contractor might be A.F.L., C.I.O., or no union. The mine union immediately made protest that the mining companies should rent the contractor's equipment, upgrade the mine manpower, hire additional manpower, and do the job themselves. Should such a proposition have been entertained, it would have defeated the original purpose of asking for bids as in all contracts the acquiring of manpower and equipment was entirely the responsibility of the contractor. To date, no settlement has been on this grievance.

Slack periods have lately developed in the ore shipments, with the result that mine manpower had to be reduced. Some contractors had large contracts which spanned over these periods. This resulted in the unions demanding that the contractor replace his force with idle manpower from the mine. Again, no agreement to these demands has been made.

This is not a brief for the contractor, but mining companies must admit that it would have been rough going during the war periods without the aid of contractors. They were of great help during the period in which development was essential. Our opinion is that the contractor has a definite place in the present and future development of the Lake Superior area. Yet no contractor should move into the area without this word of caution—"Stripping in the Lake Superior area is no bed of roses."

Contractors' Viewpoint

(*Continued from page* 59)

able to utilize his equipment on other projects and construction work, he can gear his operation to fit the peaks and valleys that are ever present in a mining operation. He has through the years gathered trained personnel who are thoroughly familiar with their specialized phases of operations. The contractor, through his increased-use-factor, is able to make available to the miner certain specialized modern equipment that results in a lower unit cost. The acquisition cost of some of these specialized tools would be prohibitive to a single operation. This is particularly beneficial in the case of the small operator who by contractual method has at his disposal the trained personnel, unitized maintenance systems and equipment reserve to draw on, which give him the same advantages as a large mine operator.

In many instances we have familiarized ourselves with the mine operators' schedules of depreciation and found them to be most idealistic. With the modernization, improvement and development of new lines of equipment, these equipment depreciation schedules should be radically revised to give the mining operator a more realistic picture of his actual mining cost. In addition, we have found that there are a number of hidden costs that should be charged into the item, but are omitted—thus again giving a distorted view of the situation.

Competition

Another very important fact for the miner to consider in his decision of whether to perform the work himself or contract is the fact that by virtue of the contractor performing certain phases of the operation, the mining company is able to devote the time of its personnel and capital toward the further development of the same project or other projects, thereby increasing his earning capacity.

Last but not least, the contractor's proposal is based not only upon past performance, but also on the ever-present competition of other contractors and of the miners themselves. This is the great factor that assures the miner of receiving the maximum amount of work for a guaranteed expenditure. And in speaking of this last item, the competition set-up by many mining companies has gained the respect and admiration of the contractors.

Operators Corner

Track Thawing

GREAT Salt Lake water has come to play an important role in mining copper ore from the mountain sides of the open-pit mine of Kennecott Copper Corp. in Bingham Canyon.

It's only been within the last four years that the salty water from the lake has figured in the operations of the mine, but now, Kennecott men have come to appreciate nature locating this great source of concentrated salt water so near.

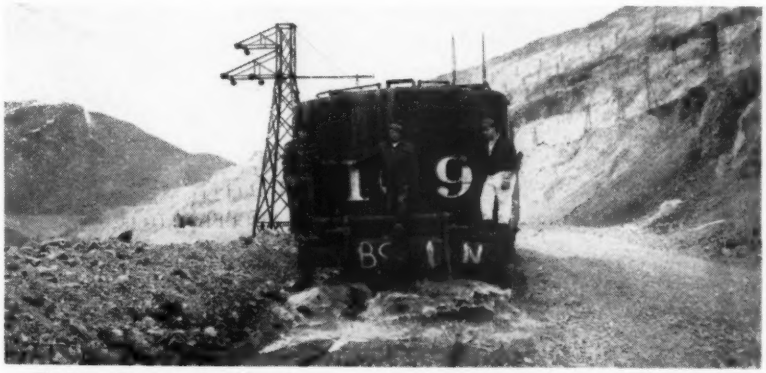
For years, mining engineers had been struggling with the problem of freezing tracks. During the cold winter months, ore and waste hauling tracks around the various levels of the open-pit mine freeze down solid. This presents a major problem when the tracks have to be shifted as the electric shovels cut back the ore banks. In the past, many thousands of rail ties were destroyed in this operation during winter.

Over the years, various methods have been used to break loose the frozen track. These included hand labor with picks and shovels, use of pneumatic drills, railroad flame throwers and even dynamite. None were practical. Dry salt sprinkled over the tracks was only effective to a certain depth if there was enough moisture and the salt went into solution.

Then, in the winter of 1953, the method of spreading dry salt and then spraying down the track with Great Salt Lake water was tried. The results were received with satisfaction. With very few exceptions, those sections of the track flushed down with the salty water two or three days before track shifting operations were started came free of the ground with relative ease.

Plans immediately were put into effect to enlarge the operation. It is equipped with spray apparatus saturate the sections of the track to be moved.

Although the salting operation costs money, Kennecott men say it has greatly aided operations. Not only has

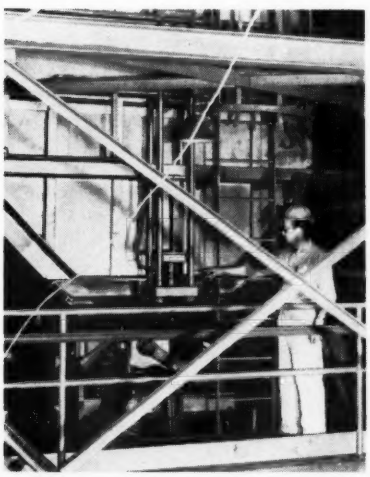


Flushing down track with salt water at Bingham Canyon before shifting track.

now standard practice during the winter months.

After a special salt scattering car has spread dry salt along the track, two specially converted 12,000-gal capacity steam locomotive tenders a savings been realized through the preservation of rail ties, but more important, track shifting operations have been more efficient. And efficiency is the key to mining low grade ore.

Bin Weighing



Location of load cell on the 50-ton bin

GAGING the quantity of hot calcined ore in the bins from which it is fed into electric smelting furnaces presented a problem recently at a new smelting plant in southern Oregon. Principal factors in the problem were the height of the bin and the fact that its supporting structure has few structural members from which to support a scale.

Solution of the problem was the use of an electrical load measuring device of 100,000-lb capacity to support one side of each of two 50-ton bins. Although a single weighing device gives only a rough measure of the weight of the bin's contents when installed in this way, its purpose is only to indicate in the control room whether the bin is empty or full.

The method of mounting the load cell, manufactured by Baldwin-Lima-Hamilton Corp., is simple: a stirrup supported by four tension rods and a saddle over a horizontal member of the supporting structure. The load cell takes the bin load from a structural member attached to the side of the bin.

The ore is dried and calcined, then goes into the bin at a temperature of about 1000° F for delivery to the furnaces. Insulation in the bin walls shields the load cell from this heat. This method of gaging will eventually be used on four 50-ton bins, all load cells being connected into a single indicating instrument in the control room.

1956 Coal Convention

Cincinnati, May 7-9

ON the following pages the Advance Program for the 1956 Coal Convention of the American Mining Congress appears. Drafted by a nationwide committee headed by G. A. Shoemaker, executive vice-president, Pittsburgh Consolidation Coal Co., the well-rounded "bill of fare" provides for 11 convention sessions devoted to developments in mining, preparation, new equipment, maintenance procedures, safety, and a forecast of coal's position in future energy markets.

Outstanding mining men and leading industrialists will address the three-day meeting, discussing not only technological advances in attaining more efficient production and lower costs, but also coal's future outlook and its relationship to other energy sources. Special luncheon sessions will be held on Monday and Tuesday, May 7 and 8, which will feature talks by Philip Sporn, president, American Gas and Electric Service Corp., and "Red" Smith, renowned sports columnist.

Entertainment for the meeting includes the famous Coal Miners Party on Monday evening, May 7, at Cincinnati's Music Hall; a baseball night, Tuesday evening, May 8, which will

(*Continued on page* 65)

G. A. SHOEMAKER
Chairman, Program Committee

Preliminary Program

MONDAY—MAY 7

10:00 am—Opening Session

A Practical Look into Coal's Future—The coal industry is definitely going forward and a high order of engineering-management will be needed to mine and prepare the expected future tonnage increases.

R. E. Salvati, President, Island Creek Coal Co., Huntington, W. Va.

The Railroads and Coal Industry—There has always been a close relationship between the railroads and coal and both industries must plan together to assure adequate future transportation from the mines to the consumers.

W. W. Patchell, Vice-President, Research and Development, Pennsylvania Railroad Co., Philadelphia, Pa.

12:15 pm—Luncheon

Address: Sources of Energy for Electrical Generation in the Next Two Decades

Philip Sporn, President, American Gas & Electric Service Corp., New York, N. Y.

2:15 pm—Strip Mining

Engineering Development and Economics of the 60-yd Shovel—This largest earth-moving unit in the United States required top engineering in its design and construction. These features are explained and costs discussed as related to shovel capacity and production performance.

James Hyslop, President, Hanna Coal Co., St. Clairsville, Ohio.

Time Study on Stripping Shovels—Shows how engineering analyses have become recognized and used as a means to determine where operating improvements can be made to increase efficiency and lower yardage costs in overburden removal.

William W. Youngblood, Superintendent, Middlegrove Mine, Midland Electric Coal Corp., Farmington, Ill.

Truck Haulage with Large and Small Units—Describe operations with various sizes of trucks for coal haulage, discussing the cost relationship between truck capacity and such factors as tonnage, length of haul, investment and maintenance.

W. C. Spencer, Assistant Chief Engineer, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan.

2:15 pm—Maintenance

A Modern Maintenance Organization—Outlines the practices of his company in preventing equipment breakdown during the working shift, showing crews employed and methods for inspection, lubrication, spot repairs and shop overhauls.

Donald B. Shupe, Mine Superintendent, Eastern Gas & Fuel Associates, Wharton, W. Va.

Mine Lighting Improves Safety and Maintenance—Describes the underground lighting installation in a mechanical mining section, and tells how this has been an aid to management in promoting safety and improving operating efficiency.

S. P. Carter, Superintendent of Maintenance, Coal Division, Armco Steel Corp., Montcoal, W. Va.

Maintenance of Ventilating and Power Conversion Equipment—Covers the type of the equipment serviced, the routine responsibilities allotted to the attendants and the shop methods for intricate and extensive repairs.

B. R. Walburn, General Master Mechanic, Vesta-Shannopin Division, J. & L. Steel Corp., California, Pa.

2:15 pm—Annual Meeting Manufacturers Division

TUESDAY—MAY 8

10:00 am—Continuous Mining

Continuous Mining with Extensible Belts—A description of the coal seam, top conditions and roof control, problems encountered with shuttles and surge cars, and present service haulage system with extensible belts to panel entry.

Michael Yonko, General Manager, Powhatan Mining Co., Powhatan Point, Ohio.

Continuous Mining in Low Coal—Tells the results of operation with continuous mining, explaining the difficulties encountered in thin seams and comparing the results with conventional mining.

E. H. Roberts, Supt., Underground Maint. and **G. W. Lockin,** Production Engr., Inland Steel Co., Wheelwright, Ky.

Five Years of Continuous Mining—Based on actual operating experience, this paper discusses the possibilities for wider application of continuous machines, showing changes involved in the mining systems, preparation, and auxiliary equipment.

Robert Billings, Assistant to the Production Manager, Rochester & Pittsburgh Coal Co., Indiana, Pa.

The Wilcox Miner—A new type continuous machine that has recently come into operation and with only a limited underground experience has demonstrated its practicability.

R. N. Morris, Assistant to Vice-President, C. H. Mead Coal Co., East Gulf, W. Va.

10:00 am—Coal Preparation

Washery Water Clarification to Prevent Stream Pollution—A description of a new plant which has been especially designed for high sludge recovery and to prevent stream contamination.

Matthew Turkovich, Director of Preparation, Island Creek Coal Co., Holden, W. Va.

The Joanne Cleaning Plant—Deals specifically with the fine coal treatment at this modern preparation plant, covering the equipment and processes to recover fuel values from the slurry.

C. C. Cornelius, Vice-President Operations, Baton Coal Co., Pittsburgh, Pa.

Barge Loading Systems—Describes the construction and operation of two modern installations that are loading coal for river shipment and explains the economic advantages offered by water transportation at these two locations.

D. H. McFadden, Assistant Chief Engineer, Ayrshire Collieries Corp., Indianapolis, Ind.

12:15 pm—Luncheon

Address: Views of Sports

Red Smith, Sports Columnist.

12:15 pm—Roof Support

Pillar Mining Making High Recovery—Based on a number of years' experience in pillar mining, this paper shows how systematic planning can utilize small unmined pillars as roof supports to make a high rate of extraction.

H. A. Cassell, Division Superintendent, Pocahontas Fuel Co., Pocahontas, Va.

Symposium on Roof Bolting—Four speakers, representing several branches and fields of the coal mining industry, will give an over-all discussion on methods and advantages of roof bolting.

Roof Bolting Machines

Robert Fletcher, Vice-President, J. H. Fletcher & Co., Huntington, W. Va.

Methods at Jenkins, Ky.

M. E. Prunty, Safety Director, Consolidation Coal Co. (Ky.), Jenkins, Ky.

Bolting to Increase Safety

E. M. Thomas, Mining Engineer Charge Roof Control, U. S. Bureau of Mines, Washington, D. C.

Advantages of Bolting

William McCullough, Safety Director, Snow Hill Coal Corp., Terre Haute, Ind.

2:15 pm—Industrial Engineering

Industrial Engineering and Cost Controls—This subject is of major importance in coal mining. It will be discussed by two speakers, using their companies' experiences to point out goals which are possible to achieve, and show where the shortcomings may lie.

An Executive Viewpoint—H. E. Jones, Jr., Executive Vice-President, Amherst Coal Co., Lundale, W. Va.

An Operating Viewpoint—Ralph B. Dean, Administrative Assistant, The Lorado Coal Mining Co., Columbus, Ohio.

An Analysis of Industrial Engineering as Applied to Coal Mining—Will explain how industrial engineering can be applied to the different operations of mining, what problems are encountered, and how the successful application will reduce operating costs.

John H. Gooch, Management Consultant, Ingle Coal Co., Elberfeld, Ind.

WEDNESDAY—MAY 9

10:00 am—Coal Preparation

Salvaging Coal from Washery Rejects—Increased mechanical mining loads higher percentages of impurities that are beyond the capacity of the original equipment in the cleaning plant. The solution is described by speakers from two fields.

H. L. Beattie, Vice-President, Elk River Coal & Lumber Co., Widen, W. Va.

L. I. Cothern, Director of Engineering, Jewell Ridge Coal Corp., Tazewell, Va.

The Corbin, Kentucky, Cleaning Plant—This new central coal cleaning plant prepares coal from several mines in the eastern Kentucky field. The paper will show equipment and method of handling through the cleaning and blending processes.

Andrew E. Hamlet, Superintendent, Coal Cleaning Plant, U. S. Steel Corp., Corbin, Ky.

The Buckheart Preparation Plant—This paper will describe the complete cleaning process from the raw coal to the final treatment of the small sizes. A high recovery of fine coal is made.

Andrew Gaber, Preparation Engineer, The United Electric Coal Companies, Canton, Ill.

10:00 am—Haulage and Power

Fire Resistant Mine Conveyor Belts—Belt conveyors are becoming conventional equipment for underground transportation and attention is now being directed toward ways to decrease the potential hazard of belt fires. Three speakers will give a thorough coverage of this subject.

Fire Resistant Belt Construction

J. L. Thornton, Manager Belting Sales, The Goodyear Tire & Rubber Co., Inc., Akron, Ohio.

Electrical Protective Devices

J. H. Nash, Electrical Engineer, Ensign Electric & Manufacturing Co., Huntington, W. Va.

Prevention of Conveyor-Belt Fires

S. P. Polack, Health and Safety Engineer, U. S. Bureau of Mines, Pittsburgh, Pa.

Automation of Mine Haulage—This paper will deal with present and proposed automatic controls for lowering the costs of rail and belt haulage from the face to the railroad cars.

W. R. Morton, General Electric Co., Schenectady, N. Y.

Trends in Underground Power—Future increases in coal production will require some adjustments in present underground power systems. Two speakers will outline how these changes will effect operating methods and transmission equipment.

F. R. Sell, Senior Industrial Power Engineer, West Penn Power Co., Greensburg, Pa.

C. B. Peck, Jr., Manager Industrial Sales, Anaconda Wire & Cable Co., New York, N. Y.

2:00 pm—Continuous Mining

Continuous Mining in Medium Height Coal—A complete description of continuous mining with boring type machines, submitting tonnage graphs to illustrate production problems.

Frank Williams, Jr., General Manager, Peck's Run Coal Co., Buckhannon, W. Va.

Pillar Extraction with Continuous Mining in High Coal—Some unique problems have been encountered and solved at this operation in a 16-ft seam, with continuous machines mining entries, rooms, and making a high pillar recovery.

Joe T. Taylor, Mining Engineer, Kaiser Steel Corp., Sunnyside, Utah.

Power for Continuous Mining—This paper will discuss requirements for a complete continuous extraction unit, describe a distribution system to minimize voltage loss and take a brief look into future power requirements for continuous operation.

J. O. Cree, Electrical Engineer, West Virginia Engineering Co., Charleston, W. Va.

2:00 pm—Strip Mining

Haulage Roads for Strip Mining—Severe winter weather with heavy snow and low temperatures have introduced a number of unusual problems in road construction and maintenance.

R. I. Richardson, Vice-President, Dakota Collieries Co., Beulah, N. D.

Recent Developments in Drilling and Blasting Overburden—Fragmentation of overburden is the key to economical strip mining and this paper will describe latest equipment and operating methods in various depths and classes of strata.

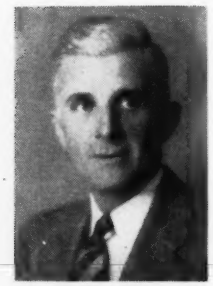
Arnold E. Lamm, Executive Vice-President, Sunnyhill Coal Co., Columbus, Ohio.

Maintenance of Strip Mining Equipment—An adequate maintenance organization is recognized as essential in a modern operation to prevent costly breakdowns. Two speakers will describe maintenance practices in the anthracite and the bituminous fields.

William C. M. Butler, Jr., Executive Vice-President, Central Pennsylvania Quarry, Stripping and Construction Co., Hazleton, Pa.

Roy M. Leseney, General Master Mechanic, Truax-Traer Coal Co., Canton, Ill.

Members—Program Committee



E. B. Agee
Indiana Coal Operators Assn.

Clayton Ball
Paul Weir & Co.

C. B. Baton
Joanne Coal Co.

C. R. Bourland
The New River Co.

J. A. Brookes
Pickands Mather & Co.

J. R. Cartlidge
Cincinnati Mine Machinery Co.

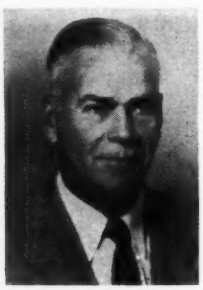
J. B. Dempsey
Pattin Mfg. Co.

W. P. Dickson
Ensign Electric & Mfg. Co.

J. E. Elkin
Duquesne Light Co.

R. W. Fox
Powhaton Mining Co.

C. A. Gibbons
M. A. Hanna Co.



James C. Gray
U. S. Steel Corp.

Cecil M. Guthrie
Sinclair Coal Co.

George C. Holton
American Cyanamid Co.

Shelly G. Hughes
Differential Steel Car Co.

E. H. Johnson
Kennametal Inc.

G. W. Jones
Amherst Coal Co.

R. D. Ketner
General Electric Co.

A. E. Long
Bradford Coal Co.

Gordon MacVean
National Mine Service Co.

(Photos Not Available)

E. F. Curtin
Pardee & Curtin Lumber Co.

W. E. Mullins
Midland Electrical Coal Co.

C. Lynn Peterson
Peterson Filters & Engineering Co.

Coal Convention

(Continued from page 62)

feature a night game between the Cincinnati Reds and the New York Giants, and the AMC "speechless" banquet at the Netherland Plaza on the evening of May 9. Three special parties have been arranged for the ladies. Tickets for the Cincinnati-New York game may be obtained by writing the Cincinnati Baseball Club Co., 307 Vine St., Cincinnati 2, Ohio.

Those planning to attend the convention are urged to register early by sending in the advance registration card distributed to the industry.

All hotel reservations are to be made direct with the hotels and all requests for accommodations should be made promptly.

H. C. McCollum
Peabody Coal Co.

R. R. McCracken
Quaker Rubber Corp.

Edward T. McNally
McNally-Pittsburg Mfg. Corp.

W. J. O'Connor
Independent Coal & Coke Co.

E. B. Philippi
Dart Truck Co.

E. R. Phillips
Lee-Norse Co.

V. D. Picklesimer
South East Coal Co.

E. R. Price
Consultant
Frederick, Md.

J. D. Reilly
Hanna Coal Co.

I. J. Richardson
Harman Mining Corp.

G. E. Sorenson
Kemmerer Coal Co.

J. A. Stachura
Enoco Collieries, Inc.

C. K. Tieche
Clinchfield Coal Corp.

Richard Todhunter, Jr.
Barnes & Tucker Co.

G. H. Utterback
United Electric Coal Cos.

Charles Vignos, II
American Mine Door Co.

A. J. Walker
Slab Fork Coal Co.

H. B. Wickey
Lehigh Valley Coal Co.

J. E. M. Wilson
Jeffrey Mfg. Co.

H. O. Zimmerman
Inland Steel Co.

Wheels of GOVERNMENT

As Viewed by HARRY L. MOFFETT of the American Mining Congress

NOT one facet of the Administration's legislative program has thus far been approved by either House of Congress. The controversial farm program will be the first piece of major legislation to reach debate stage. The President's request for a soil bank plan has been amended by the Senate Agriculture Committee to include a return to rigid price supports for some commodities, which will make the measure the subject of heated and prolonged debate. Such action will tend to stymie other major proposals which are now being readied by Congressional Committees.

Congress finally approved the controversial measure exempting independent producers of natural gas from Federal Power Commission regulation, after a free-for-all debate in the Senate which was highlighted by an inquiry into campaign contributions by parties interested in passage of the bill. The President, however, vetoed the bill and because of the closeness of the votes in both Houses, no attempt will be made to override the veto.

The House has passed the first two of the year's funds measures; the first a $65 million bill for disaster relief and flood control, and the second the 1957 appropriation of $3.6 billion for the Post Office and Treasury Departments. Committees on both sides of the Capitol are holding hearings into funds requirements for other Government agencies and hope to get the bills, usually the stumbling blocks to adjournment, to the floors as quickly as possible.

Members of the House plan to take an Easter recess beginning March 29 and ending April 8, but decision as to such a recess for the Senate depends upon how debate on the farm bill proceeds.

The biggest question on the political scene promises to be answered by the time this is published. The President, while vacationing at the Georgia plantation of Secretary of the Treasury George Humphrey, tested his physical condition and weighed his political future. At this writing he is expected to make his intentions as to a second term known in a few days.

OTC Fight in Prospect

The stage is being set for what promises to be one of the hottest fights in Congress over trade policy. The House Ways and Means Committee is currently hearing testimony on President Eisenhower's request for Congressional sanction for participation of the United States in the Organization for Trade Cooperation. This international organization would take over administration of the 35-nation General Agreement on Tariffs and Trade (GATT). U. S. membership in OTC requires Congressional approval.

In terms of long range trade policy the battle over OTC promises to be far more crucial than that over extension of the Trade Agreements Act. Many organizations, including the American Mining Congress, view U. S. participation in such a body as placing control over our own trade policies and programs in the hands of an international agency. Supporters of OTC are initiating an intense campaign, including widespread appeals through the press and radio, to secure Congressional approval. No less an intense drive to defeat the measure is being sparked by opponents of OTC.

After a recent conference with the President, Chairman Cooper (Dem., Tenn.) of the House Ways and Means Committee said that he thinks Congress will approve U. S. membership in OTC. He was supported by House Speaker Sam Rayburn. Rayburn, however, sounded a note of caution in a letter to Mr. Eisenhower on the subject. He suggested to the President that there be a preliminary count of votes before the House begins active consideration of the measure. He pointed out that last year the House came within six votes of defeating the extension of the trade agreements program, and that more votes would have to be secured from House Republicans if the OTC authorization is to be approved. He told newsmen that he felt it would be "unfortunate" if the House killed the legislation after so many other nations had approved membership in OTC.

Heavy opposition to the bill also exists in the Senate. Chairman Harry F. Byrd (Dem., Va.) of the Senate Finance Committee, which will have charge of the bill in the upper House, has often expressed his disapproval of transferring U. S. trade policy-making powers to an international body, and is expected to direct his fire against the measure when it comes before the Committee. A number of other Senators have likewise announced their opposition and are expected to join Byrd in seeking defeat of the bill.

Highway Program Pushed

Enactment of a vast nation-wide road building program, financed by taxes on highway users, appears almost certain at this session. President Eisenhower has withdrawn his support for bond financing of the huge road network in favor of a pay-as-you-go tax financing plan, and Congressional leaders of both parties are closing ranks to secure early approval of the program.

The road building program is sponsored in two bills which will be combined into one measure before reaching the House floor. They are the

Washington Highlights

OTC: In for bitter battle
HIGHWAY PROGRAM: Enactment probable
LABOR LEGISLATION: Quiescent
TAX CUTS: Questionable
COAL RESEARCH: Program suggested
AL SARENA: Hearings conclude
URANIUM: Buying program to continue?
STRATEGIC MINERALS: 1955 purchases outlined

Fallon bill, which authorizes the program and calls for Federal-State expenditures of some $51½ billion over a 13-year period, with the Federal Government providing about $37½ billion of the total; and the Boggs bill, which provides for the financing through increases in taxes on gasoline, tires, trucks, busses, trailers, and diesel fuel. The Fallon bill is the subject of hearings before the House Public Works Committee and the Boggs bill is before the House Ways and Means Committee, which must originate all revenue legislation.

The tax provisions of the measure are sure to come under fire from trucking and automobile organizations. These interests are credited with having brought about defeat of a similar measure in the House last year. The present Boggs bill would impose the following tax increases: from 2 to 3 cents a gallon, the tax on gasoline, diesel and special fuels; from 8 to 10 per cent, the excise tax on trucks, busses and trailers; from 5 to 8 cents a pound, the tax on tires of "the type used on highway vehicles"; and a new tax of 3 cents a pound on camelback used in retreading tires. The bill would exempt nonhighway vehicles from the increased tax on gasoline. The new proposed rates would become effective July 1, 1956 and would terminate July 1, 1971. Supporters of the bill have expressed the belief that its revenue yield coupled with existing taxes will pay for the program.

The American Mining Congress and other organizations last year sought and obtained an exemption from the increases for off-highway vehicles used in mining and will seek similar exemptions this year.

Labor Legislation Doubtful

The Administration's labor proposals appear to be headed for the legistive limbo at this session. Neither the House nor the Senate Labor Committee has taken up any of them as yet and from all indications they will not be considered in the near future. Bills to expand minimum wage coverage, to provide State grants-in-aid for occupational safety programs, to increase workmen's compensation for longshoremen, and to require the filing and disclosure of welfare and pension funds also have not yet been scheduled for hearing, and Labor Secretary Mitchell is somewhat "miffed" at this. Of these bills, the most likely to receive attention is that dealing with the making public of data concerning welfare and pension funds.

Mitchell, at news conferences, has charged that the House Labor Committee, headed by Rep. Graham Barden (Dem., N. C.) is burying the Administration's labor program.

Meanwhile, there are indications that Congress may act on measures to broaden social security coverage and lower the age for women to receive retirement benefits. Hearings on such proposals are currently under way before the Senate Finance Committee and are expected at an early date before the House Ways and Means Committee.

Also in the field of labor legislation, a measure has been introduced by Senator Langer (Rep., N. D.) and several others which would call for Federal inspections of metal and nonmetallic mines and quarries. Mine operators would have to submit to such inspections by the U. S. Bureau of Mines or be subject to fine or imprisonment. The bill would also require the Department of the Interior to make recommendations as to legislation needed to further its administration. A similar measure was introduced in the 83rd Congress but was not acted upon. Many observers feel that enactment of such a bill would be the first step toward granting the Federal Government police powers over safety matters in metal and nonmetallic mines and quarries. As of this writing, no hearings have been scheduled on the bill.

Tax Cut Outlook Dims

Appearing before the Joint Senate-House Committee on the Economic Report, Treasury Secretary Humphrey has made it quite plain that the budget estimates for the next fiscal year provide no room for tax reductions for individuals. He stated flatly that the Administration would oppose any tax cut which would unbalance the budget. Unless revenue receipts far exceed Administration estimates, it is expected that Congress may have difficulty in approving tax reductions this year.

Measures have been introduced by a number of Senators which would result in tax savings to small business, but thus far the Administration has not voiced its opinion of them.

On the other hand, Rep. Reed (Rep., N. Y.), ranking minority member of the House Ways and Means Committee and Rep. Cooper (Dem., Tenn.), chairman of the committee, have placed bills in the hopper which would extend the present 52 per cent corporate tax rate and current excise taxes for another year, until April 1, 1957. Reed stated that these taxes should not be permitted to expire with resulting high revenue losses. He reiterated Humphrey's position that a balanced budget should be maintained.

New Coal Research Program

Rep. John P. Saylor (Rep., Pa.) has sponsored a resolution to authorize a study leading to the establishment of a research and development program for the coal industry.

Saylor said that he wants the House Interior Committee, of which he is a member, to look into the possibility of arranging a research program for coal "in the same magnitude and on the same organizational basis" as those currently being conducted by the Atomic Energy Commission and similar groups. He declared that the objective is to determine "the best and most expeditious methods of furthering an economic revival of the bituminous coal industry." He said that he is particularly eager for the Committee to determine the practicability of constructing a large-scale synthetic fuels plant in the immediate future, for the rapid development of techniques for the commercial production of gaseous and liquid fuels from coal.

In addition to sponsoring this legislation, Saylor has called for a law placing a quota limitation on residual oil imports, and for improvements in the Government's coal purchasing policies in order to strengthen the domestic coal industry.

Lands Hearing Ends

Subcommittees of the Senate Interior and House Government Operations Committees have concluded public hearings on the granting of mineral patents to Al Sarena Mines on claims located in the Rogue River, Oregon National Forest.

Interior Under Secretary Clarence Davis appeared before the joint group and outlined the steps taken by the Interior Department before granting the patent. He pointed out that the Department, under the mining laws, must grant patents to mining claimants who have complied with the law and who have demonstrated that their claims are mineral in character.

The hearings did not develop a shred of evidence that there had been any negligence on the part of the Department in administering the mining laws in connection with the Al Sarena claims. Most observers came away with the impression that the hearings had been staged in an attempt to discredit Secretary McKay's natural resource policies. There were indications that some members of the Committee may sponsor legislation to require that future mineral patents contain a reservation of all timber on mining claims to the Federal Government. Any such move would face the determined opposition of the mining industry, which last year collaborated in legislation to eliminate abuses under the mining laws.

The subcommittees are expected to draw up reports on the hearings, and it is likely that majority and minority reports will be submitted by both the House and Senate groups.

Uranium Program Future

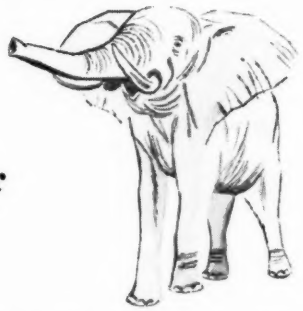
A hint that the Atomic Energy Commission may be planning to extend

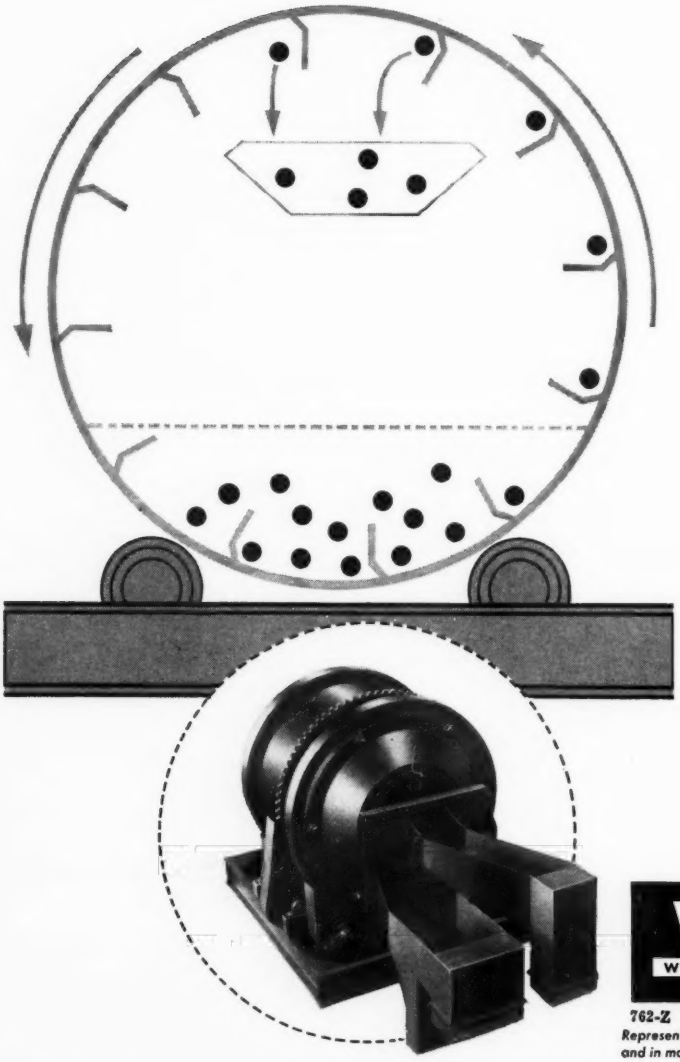
(*Continued on page* 78)

see for yourself

WHY THE WEMCO HMS DRUM DOESN'T WEAR OUT

Operators have observed that a Wemco HMS Drum Separator has a long long life.





The difference between this separator and others (that wear in a hurry) is that the entire Wemco Drum rotates as a unit. There are no moving parts inside – no chains, sprockets, screens, scrapers or sweeps to wear due to the extremely abrasive action of rock and medium. The lifters are a built-in part. In them the sink material stays in place until it drops out at top center. And even if the drum is shut-down fully loaded, there are no jamming or abrasion problems on start-up.

The common sense in this drum design is another example of Wemco's sound solution to mining industry problems. This Drum has become the most widely used of all HMS separatory vessels. It has helped, too, to make Wemco's HMS Mobil-Mill the world's most popular Heavy Media plant. Over 50% of all HMS plants use Wemco equipment. Write today and let us send you all the facts.

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AMC Personals

J. William Wetter has resigned as vice-president of the Central Pennsylvania Coal Producers' Association. He has been succeeded by **William H. Ritter.**

John J. Craig, authority on the beneficiation of iron ores, has been retained as iron ore and steel constultant for the iron ore interests of Cyrus Eaton, chairman of the board of Chesapeake & Ohio Railway and Steep Rock Iron Mines, Ltd.

Craig's first assignment will be participation with Canadian and European experts in the metallurgical work on the extensive iron ore deposits under development by the Eaton interests in the Ungava Bay area of Northern Quebec.

Craig was a pioneer in the beneficiation of low grade iron ores.

C. E. Hough, Elkins, W. Va., president of the Norton Coal Co., was elected president of the West Virginia Coal Mining Institute at its annual meeting held recently at White Sulphur Springs.

Three appointments in the Eastern district operations of U. S. Steel's Oliver Iron Mining Division have been announced. **Donald V. Erickson** was appointed general plant foreman of the Extaca taconite agglomeration plant and **Peter Del Greco** was made general drill and blaster foreman at the division's Pilotac mine. Earlier **Clifford W. Niemi** was appointed assistant superintendent of the Extaca plant.

Daniel L. Moore, vice-president and treasurer of C. A. Hughes & Co., and comptroller of Rich Hill Coal Corp., has resigned to join Pittsburgh Consolidation Coal Co.

At the annual meeting of the stockholders of Illinois Zinc Co. the following were elected directors for a term of one year: **Lawrence R. Berkey, Morris Blumberg, Henry O. Gottlieb, G. Lawton Johnson** and **Samuel Pomeranz.** The board of directors elected the following officers for the ensuing year: **Morris Blumberg,** president and chairman of the board; **Lloyd F. Johnson,** vice-president; **William F. Synnott,** vice-president; **John S. Flory, Jr.,** secretary and treasurer, and **M. B. Dotts,** assistant secretary and assistant treasurer.

Allen Pack was recently appointed superintendent of the Stephenson, W. Va., mine of the Buckeye Coal & Coke Co., succeeding **T. R. Blankenship,** resigned.

Frank J. Maloit has been named western manager of mines of The New Jersey Zinc Co., with headquarters at Gilman, Colo. For many years he had been general superintendent of the company's Empire Zinc Division, which operates mines in Gilman, and at Hanover, N. M.

The New Jersey Zinc Co., Franklin, N. J., has appointed **Donald McKechnie** as superintendent of its Franklin-Sterling operation in New Jersey and **Sterling S. Huyett** as superintendent of its Friedensville operation, a mine being developed in Pennsylvania.

McKechnie has been employed at the Franklin-Sterling operation for over 36 years, having been mill chief, chief of power and shops, and assistant superintendent.

Huyett had been assistant general superintendent of the Friedensville development. He had previously been employed by the company at a mine near Gilman, Colo., and from 1945 to 1952 he served as superintendent of the company's Hanover, N. M. mine.

Paul R. Williams was recently named superintendent of the United States Steel Corporation's Mine 31 in the Lynch, Ky., district.

James F. Roe has been promoted to manager of the Florida operations of the Phosphate Chemicals Division of International Minerals & Chemical Corp. and **Charles A. White** has been advanced to manager of the division's Tennessee operations. The promotion of **Robert V. Safford** to assistant manager of the division's Florida operations and **Ralph W. Lorentz** to plant superintendent of the division's Bonnie plant, near Bartow, Fla., has also been announced.

A. Baird Harris has been appointed director of purchases of The Anaconda Co. He joined Anaconda in 1945 as assistant purchasing agent and has been purchasing agent for the company since 1948.

The following appointments have been announced by the Penn-Dixie Cement Corp., Nazareth, Pa.

Richard P. Scott is appointed chief engineer with headquarters in Nazareth. **John H. Jones** has been named operating assistant, succeeding Scott. **Michael B. Hoffner** succeeds Jones as superintendent at Plant No. 4. **Omar J. Glantz** was appointed superintendent at Plant No. 10, replacing **Fred B. Tripp,** resigned. Glantz was succeeded by **Billy B. Nall** as superintendent of Plant No. 2.

Ivor G. Pickering of Salt Lake City has been appointed chief designing engineer of Kennecott Copper Corporation's Western Mining Division engineering department, it was announced by S. D. Michaelson, chief engineer.

Formerly assistant mechanical engineer, Pickering has been employed in mining since 1935, when he joined the Utah Copper Co. at Bingham Canyon.

The American Metal Co., Ltd., has announced that **F. H. Stewart,** vice-president and general manager of its subsidiary, Southwest Potash Corp., Carlsbad, N. M., has been appointed manager of the Mining and Exploration Department of the American Metal Co., with headquarters in New York. **W. Aubrey Smith,** assistant general manager of Southwest Potash Corp., succeeds Stewart as general manager.

F. H. Stewart

Douglas Crickmer, superintendent of Pond Creek Collieries mines, has resigned to accept a position with the Pocahontas Land Co. in Bluefield, W. Va. Crickmer had held the post of superintendent with Pond Creek Collieries and continued in the same position when it was taken over by Osborne Mining Corp.

Succeeding Crickmer as superintendent is **James D. Carter,** formerly preparation engineer for Red Jacket Coal Corp.

Gordon H. Chambers has been named chairman of the board and **L. G. Bliss** president of Foote Mineral Co. Chambers, formerly president, fills the post left vacant by the retirement of **H. C. Meyer** in December.

Adin A. Brown has been elected by the board of directors of American Smelting & Refining Co. as a director and vice-president in charge of mining operations. He succeeds **R. F. Goodwin**, who is retiring. Goodwin will devote full time to Southern Peru Copper Corp. and will continue to be chairman of the executive committee of that company.

Brown had been general manager of the Mexican mining department of American Smelting & Refining in El Paso, Tex. This position will be filled by **C. F. Jordan**, formerly assistant manager.

Morton Jones, manager for the Kirk Coal Mining Co., Beech Creek, Ky., was recently named president of the Western Kentucky Mining Institute.

Several changes affecting Kennecott Copper Corporation's Chino Mines Division became effective January 1.

Bert A. Robbins, division comptroller, was made assistant to the general manager. He was succeeded as comptroller of the company's New Mexico property by **Howard R. Miller**, assistant division comptroller. **Frank S. Hardy, Jr.**, formerly with Kennecott's Internal Audit Division, Western District Office, Salt Lake City, Utah, was transferred to the Chino Mines Division as administrative accountant.

L. L. Fleshman, superintendent of Slab Fork Coal Co. mines, has succeeded D. C. Sizemore, New River Co. superintendent, as president of the New River and Winding Gulf Electrical, Mechanical, and Mining Institute.

Robert C. Weed has been appointed general superintendent of the Cananea Consolidated Copper Co., Cananea, Sonora, Mexico. A graduate of Michigan Tech, Weed went to work for the Anaconda Co. at Butte in 1946, and was transferred to Cananea two years later.

J. M. Stanley has been promoted to general superintendent of the Sycamore Coal Co. He will be in direct charge of all mining operations of the Buccaneer Mine, Patterson, Va.; New Cinderella Mine, Hatfield, Ky.; and the Cinderella and Alma Mines, Cinderella, W. Va.

Marvin Harmon was promoted from mine foreman to superintendent of the Buccaneer Mine and **Willis Smith** was promoted from section foreman to mine foreman.

The appointment of **Charles Harry Burgess** as vice-president of Bear Creek Mining Co., the domestic exploration subsidiary of Kennecott Copper Corp., has been announced. Burgess will have charge of the domestic exploration activities of the company. His office will be in New York City.

— *Obituaries* —

Joseph H. Hedges, 73, retired U. S. Bureau of Mines official, died in Washington, D. C., January 12, after a brief illness.

From 1926 to 1940, Mr. Hedges was special assistant to the director of the Bureau of Mines in Washington. He then transferred to College Park, Md., where for two years he was chief of the Eastern Strategic Minerals Section of the Bureau's former mining division. In 1942 he took charge of all Bureau mineral investigations in Arizona, New Mexico and Texas. During 1943-1945, he supervised work on the Bureau's San Manuel copper project in Pinal County, Ariz., biggest wartime discovery of copper reserves.

Mr. Hedges was recalled to Washington in 1949 as chief of the Bureau's Minerals Division. In 1952 he became a special assistant to the director, where he served until his retirement later that year.

Gustave H. Overstrom, 86, inventor of the Overstrom deck concentrating table, died January 23 at his home in Los Angeles.

A native of Sweden, Mr. Overstrom came to the United States as a young man and at the turn of the century made the mill designs for Anaconda Copper Co. installations in Montana. He was considered a leading authority on ore dressing.

Arthur H. Findeisen, 67, Wisconsin's first state mining engineer, died January 22 in Madison, Wis.

Mr. Findeisen joined the Wisconsin Industrial Commission as the State's first mining engineer in 1920 and helped write the State's first mining code. In 1925 he was given a leave of absence to the U. S. Bureau of Mines and helped draft the Federal Mine Safety Code. During World War II he was federal coordinator of mines in Wisconsin.

Samuel Judson Craighead, 57, well known coal mine executive, died recently.

Mr. Craighead was with the H. C. Frick Coal Co. for a number of years. He first was superintendent of the National No. 3 mine for the U. S. Steel Corp. subsidiary in Fayette County, Pa., and from 1944 to 1948 was superintendent of Robena mine, the largest mechanized coal mine in the world. In 1948 he was transferred to Salt Lake City as vice-president and general manager of the United States Fuel Co. now U. S. Steel's Coal Division. He became president of U. S. Fuel before his retirement.

William George Freeman, 86, an original property owner of the Pocahontas Fuel Co. and director of that company died November 30 in Butler, Pa.

Born in 1870 in Shamokin, Pa., Mr. Freeman came to the coal fields at an early age. He first worked as a miner at the Quinnimont mine in the New River field. In 1884, as a member of the Freeman-Jones Co., he went to Mercer County for the opening of the Casewell Creek mine. This mine was the third to be opened by the coal interests which later formed the Pocahontas Fuel Co., with Mr. Freeman taking an active part in the organization.

Lambert K. Williams, mine foreman at the International Harvester Mines at Benham, Ky., died February 3 following a heart attack. Mr. Williams had been with International Harvester for about 20 years.

R. Kirby Shirley, 56, senior vice-president and member of the board of directors of Freeport Sulphur Co., died January 24.

Mr. Shirley, who had been associated with the American sulphur industry for 34 years, had a prominent role in the growth which the industry experienced during the past decade. As executive vice-president of Freeport, a post he occupied before being elevated to senior vice-presidency, he helped guide the development between 1950 and 1955 of four new mines in the Gulf Coast region of Louisiana and Texas.

Mr. Shirley started with Freeport in 1922 as chief clerk to the auditor in the company's offices in Freeport, Tex. At that time the sulphur industry in this country was relatively small, the use of sulphur being only about a tenth of what it is today. In 1930 was transferred to New York as assistant vice-president and controller. In 1934 he was elected treasurer, a title which he continued to hold in his various other positions. In 1940 he was made vice-president and in 1948 executive vice-president and director.

How soon will the Yieldable Arch start saving money for you?

Install Bethlehem Yieldable Arches in your mine, and they'll probably maintain their structural integrity throughout the service life of the shaft. And when you figure the initial cost of the Yieldable Arch against the cost of frequent timber replacements, you'll readily understand why so many mining men say the arch pays for itself in its first year of service.

On top of that, you'll find it a simple matter to take down the arches and re-use them at other locations. You have good reason to expect 100 pct recoverability!

The Yieldable Arch is made up of rolled-steel segmental sections which are heavily flanged to resist buckling and torsional stresses. One segment nests inside another in an overlapping joint. Rugged U-bolt clamps, used in pairs to secure the joint, are drawn up tightly enough to hold fast under normal loads.

However, when unusual pressures begin to bear down, the joints can give sufficiently to relieve the load. Thus safety underground is maintained.

Each arch set is tied to its neighbor through a series of horizontal braces, to provide lateral rigidity in the structure. Timber lagging is usually used, but steel lagging can be furnished if desired. Your own men can install Yieldable Arch sets without special skills or constant supervision.

The arches shown in the photograph were especially designed for this particular job; your own mine might well use the standard Yieldable Arch. One of our engineers would welcome a chance to look into the matter with you to see how you might benefit from this new and economical development. How soon?

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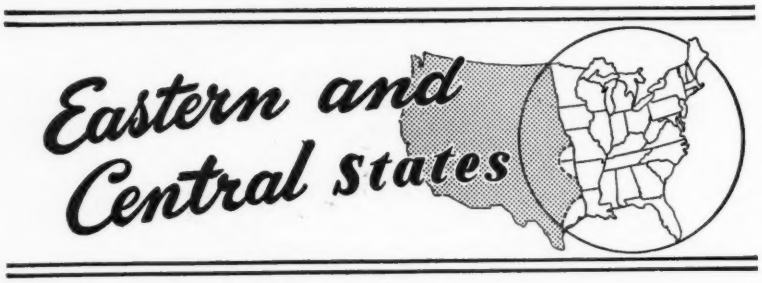
BETHLEHEM STEEL



New Cleaning Plant

Jewell Ridge Coal Corp. has closed a contract with Heyl & Patterson, Inc., Pittsburgh, Pa., for installation of a cleaning plant at its Melville No. 9 mine at Stollings, Logan County, W. Va.

The contract calls for a cleaning plant to wash and dry 80 tons per day of three-eighths or one-quarter in. by zero coal.

Florida Cement Plant

General Portland Cement Co., Chicago, will build a $10,000,000 cement plant on a 2490-acre site about 19 miles west of Miami, Fla. When completed, the new plant will have an annual capacity of 1,250,000 bbl of cement and will employ about 150 persons.

New Iron Ore Company

A new corporation has been formed by Cleveland-Cliffs Iron Co. and four steel mills to mine and beneficiate low-grade iron ore (jasper) into high-grade pellets. Known as the Marquette Iron Mining Co., it will lease the Republic and Empire mines and own the concentrating and pelletizing plants.

Cleveland-Cliffs has 47.5 percent stock interest in the new company and will operate the properties.

Construction of the pelletizing plant at Eagle Mills, Mich., which will pelletize the Republic mine concentrate, is continuing steadily, the report added, although it now appears that the strike at Westinghouse, from which certain equipment has been ordered, will delay the start of operations several months.

Michigan Society to Meet

The Michigan Engineering Society will hold its 76th Annual Convention at the Pantlind Hotel, Grand Rapids, May 11 and 12, 1956.

Mine Titanium Ore

Metal & Thermit Corp., New York, has purchased an 800-acre tract near Montpelier, Va., and will soon begin construction of a plant for mining and processing of titanium-bearing ore. Construction will start later this spring and the plant is scheduled to be completed next autumn. When completed, the $750,000 project will employ between 40 and 50 people.

Coal-Fired Power Plant

A modern coal-fired steam-electric power plant has been built at Silver Bay, Minn., on Lake Superior's north shore, by Reserve Mining Co. in conjunction with its taconite processing project. The plant will provide power for the E. W. Davis Works as well as for Reserve's other commercial processing plant at Babbitt, Minn.

A 50,000-kw turbin generator will provide the 100 kwh of electrical energy required for every ton of iron ore pellets produced from taconite at the plant. The E. W. Davis Works has a rated capacity of 3,750,000 tons of iron ore pellets annually, while the Babbitt plant has a rated annual capacity of 300,000 tons.

Begun two years ago, and designed for an ultimate capacity of 150,000 kw —equivalent to approximately 200,000 hp—the power plant incorporates the latest developments in power generation. The boiler will be fired by bituminous coal, pulverized and air-blown into six burners requiring 550 tons of coal per day. Coal will be brought to Silver Bay by boat through the Great Lakes.

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To Build Bromine Plant

Michigan Chemical Corp., St. Louis, Mich., and Murphy Corp., El Dorado, Ark., will jointly construct a plant for the production of bromine near El Dorado. The announcement of the joint venture said the plant will use brine from a section of the Smackover oil district of southern Arkansas as its raw material feed. Capacity of the plant was not announced.

Subsidiary Company Formed

Formation of Freeport Oil Co. as a division of Freeport Sulphur Co. has been announced by L. M. Williams, president of the parent company. C. A. Wright, chairman of Freeport's executive committee, has been elected chairman of the new company, and H. C. Petersen, a Freeport vice-president, has been elected president. C. M. Sampson, C. G. Cary and D. D. Utterback were made vice-presidents.

The new company was formed, Williams said, "in recognition of the growing importance of Freeport's oil and gas interests and in order to facilitate the search for and development of additional reserves of these resources." Freeport, in partnership with two independent oil producers, recently set a new world's depth record of 22,570 ft in drilling for oil in the Louisiana marshland 40 miles southeast of New Orleans.

Island Creek Appointments

N. T. Camicia, general manager of mines for Island Creek Coal Co., has announced the following major appointments in the organization following the acquisition of the Red Jacket Coal Corp. properties which became effective January 1.

Rhein H. Tinsley, assistant division manager of the Bartley Division, was

R. N. Tinsley

M. M. Marchich

appointed division manager of the Red Jacket Division which is composed of Mitchell Branch, Junior and No. 17 Mines.

Michael M. Marchich, assistant division manager of the Holden Division, was appointed division manager of the Wyoming Division which is composed of No. 12 and No. 9 Mines at Coal Mountain, Marianna Mine, and Wyoming Mine, all located in Wyoming County, W. Va.

Milton B. Harper, formerly superintendent of Mine No. 26, Rockhouse Division, was appointed superintendent of the Keen Mountain Mine, located in Buchanan County, Va.

Louis Skiba, formerly night mine foreman at Mine No. 7, Holden Division, was appointed superintendent of the Mitchell Branch Mine.

G. Frank Davis, who has spent a number of years in a supervisory capacity with the Red Jacket Coal Corp., was appointed superintendent of the Junior Mine.

Milburn W. Hall, formerly general mine foreman of Mine No. 27, Holden Division, was appointed superintendent of the No. 17 Mine.

O. L. Childress, superintendent of the Marianna Mine, was appointed superintendent of the Wyoming Mine.

Douglas W. Halstead, superintendent of the Wyoming Mine for the Red Jacket Coal Corp., was appointed superintendent of the No. 12 Mine at Coal Mountain.

High Grade Mineral Concentrates at LOW Cost

Concentration of minerals is best handled by the SuperDuty®DIAGONAL-DECK®Table. Not only does it readily recover a surprisingly high percentage of the values, but it does so with a minimum of loss to the tailings and a greatly reduced volume of middlings.

The result is exceptionally high grade concentrates at definite savings in cost, a portion of which is in the reduced wear and tear on the re-circulating equipment.

Write for full information and verified performance records. Ask for Bulletin 118-B.

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Type "CPC" Classifier

This all steel Constriction Plate Classifier is available in 1 to 10 or more cells. Novel secondary classification sharpens the separations made by each main cell. Advantages offered are: (1) accurate classification or sharp sizing, (2) easy effective hydraulic water regulation, (3) as many spigot products as there are cells, (4) continuous discharge, (5) no moving parts (6) low maintenance cost.

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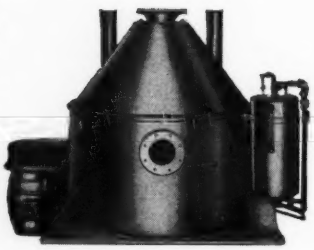

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. . . your best buy is C·M·I. Through 40 years of experience, C·M·I has developed a dryer that provides an actual saving of 24% in horsepower over other comparable units. This new, improved centrifugal dryer offers you smoother, more dependable performance in addition to drastically reduced operating and maintenance costs.

If you are searching for an economical answer to that expensive heat-drying problem, write C·M·I for particulars.

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Reap additional profits with efficient slurry recovery.

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Safety Day Program

The presentation of awards highlighted a coal safety day program recently at the Holden, W. Va., Recreation Center in honor of more than 2100 Island Creek Coal Co. employes and officials who had completed a 10-week course in accident prevention.

W. R. Park, Chief, U. S. Bureau of Mines, Mount Hope, made the presentation of 100 percent awards to five local unions and six mine superintendents.

Park presented awards to Toscoe Garrett, construction superintendent; G. E. Marcuzzi, No. 7 Mine superintendent; Joe Sarsfield, No. 22 Mine superintendent; Jack Adams, No. 24 Mine superintendent; Walter DeBord, No. 27 Mine superintendent; T. A. Salvati, No. 28 Mine superintendent, and to each of the local unions.

Titanium Deal Working

The Crane Co., Cleveland, and Republic Steel Corp. have been negotiating for the purchase by Republic of one-half of Crane's interest in Cramet, Inc., a producer of titanium sponge with a plant at Chattanooga, Tenn. Cramet is now a wholly-owned subsidiary of Crane.

In 1953, Cramet was awarded a contract by the Government calling for yearly production of 6000 tons of titanium sponge over a five-year period. The plant began operation in January 1955. The Government is under contract to buy from Cramet the 6000 tons of annual titanium sponge production over the five years.

Republic began commercial production of titanium ingot, plate, sheet, strip and bar shapes in 1952.

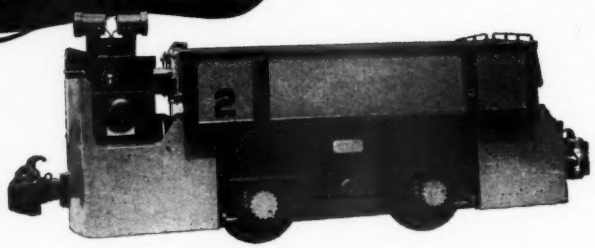
Glen Alden Expands

Glen Alden Corp., Wilkes-Barre, Pa., a leading anthracite coal producer, has acquired the Ward LaFrance Truck Corp., manufacturer of fire-fighting apparatus and emergency vehicles. The truck company, whose manufacturing operations are centered at Elmira, N. Y., is now a subsidiary of Glen Alden.

Francis O. Case, Glen Alden president, said the acquisition will be financed out of cash and future earnings and is another step in Glen Alden's plans to broaden the base of its operations to include businesses outside the anthracite industry. Glen Alden, in its initial move toward greater diversification last year, acquired the Mathes Co., air conditioning equipment manufacturer.

GREENSBURG EIGHT TON MONITOR
Storage Battery Locomotives

. . . for top performance "Double Equalizers" make the difference



The Greensburg 8 ton Monitor is equipped with two glass insulated motors, contactor type controller and double equalizers. These double equalizers make the difference in performance . . . more tractive effort, better brakes, better riding qualities and longer battery life than any other storage battery locomotive of equal weight and battery capacity!

All Greensburg locomotives are Custom-Built to meet your requirements in both single and double motor drive with drum, cam or contactor type controllers.

For more earning power per invested dollar specify Greensburg Storage Battery Locomotives.

GREENSBURG MACHINE CO.

112 Stanton St.
GREENSBURG, PA.

Mountaineer

(*Continued from page* 28)

are required to counter balance the front end.

In addition to its many other claims to fame, The Mountaineer probably represents the highest development in the art of welding up to this time. It is welded throughout, not one rivet was used in its construction.

But Part of A Program

The building of The Mountaineer is part of a three-phase program which Hanna Coal Company's parent organization, the Pittsburgh Consolidation Coal Co., has undertaken. First phase of the program is the improvement of present mining methods. The ultimate aim being more coal at less cost. The Mountaineer falls into this category, principally by greatly increasing stripping reserves of the company. In addition, it is a tool for increased conservation of coal, recovery from open-cut mining being greater than from deep mining.

Second phase is the development of a more economical medium of transportation. Pitt Consol is carrying on a number of experiments aimed at reducing the cost of moving coal. The

Rear quarter view of the giant shovel

one which has received the widest publicity is the 108-mile pipeline to carry coal and water slurry from the Georgetown preparation plant to an electric utility consumer near Cleveland, Ohio.

Third phase of the over-all program is development of a broader utilization base. The purchase by Pitt Consol of a chemical plant in New Jersey last year was one step in this direction. At a new mine near Cresap, W. Va., for which ground has just been broken, it is anticipated that coal will first be sent through a char plant to drive off the volatiles which will be used as chemical raw materials. The residue char will be used to fuel a large electrical generating plant nearby.

Construction of The Mountaineer, then, is but one of the ways that the coal industry is betting on itself in the big race for a substantial share of the energy market of the future. The vision of the men who conceived the idea and the confidence of those who were willing to stake over $2,500,000 in a single piece of equipment is typical of the spirit which over the past generation has placed coal mining in the front ranks of modern industry.

Wanted

Experienced diamond drill designer. Apply Chicago Pneumatic Tool Co., Utica, N. Y.

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EXCELLENT CONDITION

TLM 19 Exide 24-Cell Ironclad Battery in steel tray with covers and 3U-11020-X Permissible Fuse Box and Receptacle. (NEW)
MG SETS
Westinghouse MG Set 500 KW.
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600 H.P. Ottumwa drum hoist for 514 ft. and 551 ft.—1 ½" rope.
W.S. Morgan Hoist—250 H.P. for 460 ft.—1 ¼" rope.
Clarkson Rubber-Tired Loading Machine—Type 28FA #1000, Red Bird Loader.
McKinlay Entry Driver—230 volts, D.C.
1 New GE-125 H.P. Motor
Various other motors from 5 H.P. to 75 H.P.

MANY SERVICE PARTS FOR MINING MACHINES

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FREEMAN COAL MINING CORPORATION
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Clay Mines Boom

Clay mining in Washington County, Ga., is booming in the wake of continued high demand by manufacturers of coated paper and cardboard for high-grade clays. Several companies are operating three shifts, seven days a week, and the combined output of all clay mines in the county is reported to be about 40 to 50 carloads per day. No immediate decline in demand is foreseen.

Two companies liquify their clay and pump it to nearby refining plants. Three other companies haul raw clay in trucks to be graded, refined and shipped by rail to various points in the East.

Clay from the Sandersville plants is shipped in box cars lined with paper to keep out dust.

Iron Ore Shipments

Great Lakes ore boats carried 87,460,000 tons of iron ore south from the Western Lake Superior region during 1955, the fourth heaviest season in history, the Michigan Department of Conservation has reported.

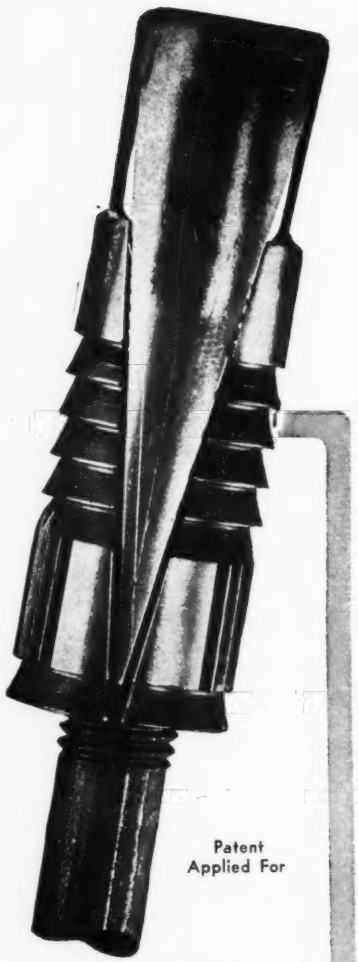
The 300-boat ore fleet got off to a slow start with scattered shipments during April and no apparent hurry on the part of shipping companies. Early predictions indicated only 70,000,000 tons would be shipped during the year. Other conditions hampered shippers, too. Lake levels were low, so ships passing through the Soo locks could not load heavily. Also, early winter freezes made shipping tough in November and ended the season early in December.

Heavy fall shipments made up time and tonnage lost in the slow spring and summer. The year ended only 8,390,000 tons behind the all-time record of 95,850,000 tons set in 1953.

Explores Beckley Coal Seam

The Slab Fork Coal Co., Beckley, W. Va., is currently exploring a new tract of the Beckley coal seam running through Raleigh County. A. J. Walker, general manager of the company, said that if explorations are successful the company will develop the mine with production capacity of about 300 tpd.

A four-entry system will be used to explore the 48-in. seam which contains a number of faults. It is planned to enter the seam with a 2000-ft entry, turn right for 2000 ft, then left for another 2000 ft. Coal will be hand loaded onto chain conveyors which will dump onto belts.



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Bolting results in less timber maintenance—improved ventilation—reduced waste handling—fewer fire hazards—wider openings—faster haulage and less material handling. Prove the benefits by making your own tests—samples of the PATTIN shells "D-1" (shown above) or the "D-2" will be furnished upon request.

In Western States

PATTIN expansion shells are available and serviced exclusively through The Colorado Fuel & Iron Corp., Denver, Colorado.

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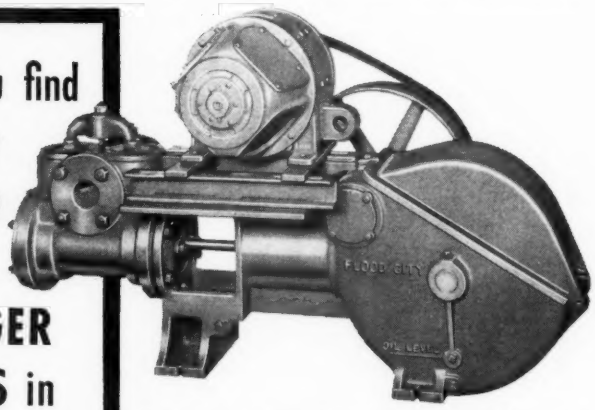
Why you find so many FLOOD CITY PLUNGER PUMPS in use in the coal industry



This popular Plunger Pump, which uses the Flood City Reversible Water End, pumps efficiently even under the most difficult conditions. Built of heavy, acid-resistant bronze or stainless steel, easy maximum flow of water is certain at all times. A large, hinged cover on the completely enclosed power end allows quick access for inspection or repair of working parts. Self-lubrication via the crankcase reservoir keeps all moving parts working smoothly requiring a minimum of maintenance. The intermediate shaft rotates on roller bearings. Piston rod is shielded to prevent water from reaching the power frame.

Available in several sizes to handle as much as 100 GPM

Detailed information and prices for your particular pumping problem may be had at your request.

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Western States

Merger Plan

Illinois Zinc Co. and Hayden Projects, Inc., are negotiating the merger of the two companies by an exchange of stock.

Hayden Projects, Inc., was incorporated in New York in 1954 and is the holder of the licenses for hydrometallurgical treatment of copper scrap, ore and concentrates and the rolling of non-ferrous metal products.

Illinois Zinc Co. operates zinc rolling mills in Chicago and Peru, Ill., and a zinc concentrating plant in Deming, N. M. It produces lead-zinc ores from mines in New Mexico and copper from its Shannon property in Arizona.

Kaiser Chemicals Expansion

Kaiser Aluminum & Chemical Corp. has announced it will undertake a $3,000,000 expansion program to increase its capacity to produce refractory and magnesia products. New facilities will be added at the Moss Landing, Calif., seawater magnesium plant and the Columbiana, Ohio, basic refractories plant now under construction. The seawater handling capacity at Moss Landing will be doubled and its capacity to produce periclase, or calcined magnesium, will be increased by over 50 percent, and a new rotary kiln will be installed. New equipment at Columbiana will include more pressing and materials handling facilities to increase the plant's handling by 50 percent.

Howe Sound Research Center

Salt Lake City will become the Western Hemisphere research center for Howe Sound Co., according to Dr. W. Martin Fassell, Jr., who will direct the operation.

The new 78,000-sq ft laboratory center will represent a total investment of about $150,000 and is scheduled for completion March 29.

The facility will serve Howe Sound's Britania Beach Smelting & Refining Co., British Columbia; Calera Mining Co.'s Cobalt, Idaho, and Garfield, Utah, cobalt mine and refinery; Howe Sound Exploration Co.'s Snow Lake, Manitoba, gold mines; Chelan, Wash. division lead-silver zinc properties; and El Potosi and El Carmen, Mexico, lead-silver mines. The research center will house a complete pilot-plant size flotation set-up, extensive facilities for electrolytic process work, provision for physical metallurgy in cobalt alloys and a full wing devoted to pyrometallurgy, Dr. Fassell reported.

New Mexico Convention

The 1956 Convention of the New Mexico Mining Association will be held in Carlsbad, N. M., November 1-3. A meeting of the General Committee is planned for the first week in March, when over-all plans for the Convention will be formulated. The meeting will be a joint undertaking with the Southwest International Mining Association of El Paso, Texas.

Nevada Barium

The Battle Mountain, Nev., mill of the Magnet Cove Barium Corp., of Houston, Texas, has been placed into operation and is now processing barium ores. The 175-ton mill will handle ore from the company's Greystone Mine and other mining operations in the Battle Mountain area.

Bunker Hill Option

Bunker Hill & Sullivan Mining & Concentrating Co. has taken options to purchase 53 lead-zinc mining claims in British Columbia, according to Roger McConnell, chief geologist.

The claims are located on the east side of Duncan Lake, north of Kootenay Lake and about 30 miles north of Kaslo.

Idaho Phosphate

Construction of a $500,000 phosphate mining and processing operation by the Central Farmers Fertilizer Co. is scheduled to start this year. The company will mine and process phosphate on a 275-acre plot, six miles northeast of Georgetown, Idaho. The Union Pacific Railroad is to construct a siding and Utah Power & Light Co. is to supply power to the Georgetown plant.

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project drillers
know drill bits

. . . and ROK-BITS are their favorites!

Carbide Rok-Bits—cross, "X" or chisel types—gauge sizes: 1¼" thru 6".

One of the largest taconite developments in the Mid-West tested Rok-Bits® against all others. Result: Almost 100% usage of Rok-Bits. If you are using another carbide bit let us show you by COMPETITIVE TEST what Rok-Bits can do to boost your output and profit. Call our nearest plant. Request Bulletin B-1.

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Brunner & Lay of Portland, Inc.
660 N. Tillamook St., Portland 12, Ore.

Wheels of Government

(*Continued from page 67*)

its guaranteed price program for uranium ore beyond its scheduled March 31, 1962, termination date was contained in a recent speech by AEC Commissioner W. L. Libby.

Speaking before a Military-Industrial Conference in Chicago, Libby pointed to the present expiration date for uranium ore buying and said the AEC recognizes that industry must have an assurance of a continuing government market over a reasonable period of time "if a high level of exploration and development is to be maintained." He pointed out that the economies of important areas in several Western States are heavily dependent on uranium mining and milling, and that an active and healthy domestic mining industry is an important factor in the development of atomic power and other peaceful uses of uranium. He then stated: "Therefore, the uranium procurement program should be designed to prevent 'boom and bust' operations and to permit a gradual and orderly transition from a government-controlled to a commercial uranium market." He said the AEC is giving considerable thought to providing for the gradual transition to a commercial market.

Shortly before this address, Jesse C. Johnson, AEC raw materials head, had told a mining audience in Denver that he "did not have the answer" to whether the AEC would extend the buying program.

Meanwhile a nine-man panel, headed by Robert McKinney, New Mexico editor, has recommended to the Joint Congressional Committee on Atomic Energy that the beginnings of a free market for uranium be established, to supplant the Government ore-buying program, with the remainder of the market based upon tonnage guarantees to meet military requirements. The same panel indicated that atomic power is not likely to make heavy inroads into the quantity of bituminous coal required for power generation.

Strategic Minerals Purchases

The General Services Administration has made public the quantities bought through December 31, 1955, under the Government purchase programs for domestic tungsten, manganese, chrome, mica, beryl and asbestos.

GSA reported the purchases made and the goals for each material as follows: *Tungsten*—2,379,975 short ton units purchased against a goal of 3 million short ton units; *manganese*—2,036,525 long ton units delivered to the Butte and Philipsburg depots out of a combined goal of 6 million long ton units, and 5,331,520 long ton units delivered under the carload program which has a goal of 19 million long ton units; *chrome*—101,634 long tons purchased against a goal of 200,000 long tons; *mica*—7,526 short tons purchased against a goal of 25,000 short tons; *beryl*—833 short tons delivered against a goal of 1500 short tons; and *asbestos*—1,261 short tons of Crude No. 1 and 2 delivered against a goal of 1,500 short tons.

Legislation to increase the quantity goals and extend the expiration dates for these programs is lying dormant in the Senate Interior Committee.

Gilsonite Shaft

American Gilsonite Co. is engaged in sinking a 1000-ft, four-compartment shaft on its Cowboy vein near Bonanza, Uintah County, Utah, according to E. F. Goodner, president. The shaft, which is part of a $13,000,000 program, is expected to be completed this year. The program will result in the movement by pipeline of the gilsonite to Fruita, Colo., for processing into high test gasoline and metallurgical grade coke. American Gilsonite is a joint affiliate of Standard Oil Co. of California and Barber Oil Corp.

Howe Sound Changes

The Howe Sound Co. has announced several changes in personnel in its exploration department and the opening of three new exploration offices.

In Canada, the Britannia Mining & Smelting Co. subsidiary will open offices in Toronto and Vancouver. Frank Ebbutt will direct the activities of the Toronto exploration office and will be assisted by Nelson Hogg, formerly chief geologist of the Snow Lake Manitoba division. Allen Killin, formerly chief geologist of the Britannia division of the Britannia Mining & Smelting Co. will direct the activities of the new Vancouver office and will be assisted by John Lamb, also from the Britannia division.

Harold B. Smith will direct the activities of the new exploration office in Salt Lake City and will be assisted by T. L. Wilson, formerly chief geologist of the Chelan division of Howe Sound. R. A. Paasch will become chief geologist at the Chelan division.

Nels B. Vollo assumes the position of chief geologist at the Snow Lake division and Douglas Markland has been appointed chief geologist at the Britannia division.

Build Cement Plant

Ideal Cement Co., Denver, Colo., will build a new $12,000,000 cement plant unit adjacent to its present unit at Ada, Okla. The new two-kiln unit will have a capacity of 9000 bbl per day of cement, boosting the company's production capacity at Ada to 5,200,000 bbl a year from 2,400,000.

The expansion is part of a program which will raise the company's overall capacity to approximately 28,000,000 bbl this year from the estimated 22,500,000 bbl it produced in 1955.

On January 27, Thomas B. Nolan was sworn in as director of the Geological Survey by Floyd E. Dotson, chief clerk, Department of the Interior in the presence of Secretary Douglas McKay. Dr. Nolan has been a career Civil Service employe since his appointment as a junior geologist in 1924. He succeeds William E. Wrather who retired because of ill health. Dr. Wrather first joined the Survey for the summer of 1907 and later rejoined when he was appointed director in 1943.

—Los Angeles Mining Show—

PROMINENT members of the mining fraternity have accepted appointments to committees which will develop various phases of the Mining Congress' 1956 Metal Mining and Industrial Minerals Convention and Exposition to be held in Los Angeles October 1-5.

General Chairman of this important event—which is expected to draw thousands of mining men from all over the United States and from many foreign countries—is Garner A. Beckett, President, Riverside Cement Co., Los Angeles. He will be assisted by William C. Browning, Gold Fields American Development Co., and Henry T. Mudd, President, Cyprus Mines Corp., as Vice-Chairmen, and Blair W. Stewart, Vice-President, Coronado Copper and Zinc Co., as Secretary of the General Committee.

Garner A. Beckett

Chairman of the Trips Committee, which is arranging a number of field trips to various Southern California mining and mineral processing operations, is D. L. Marlett, Vice-President, Great Lakes Carbon Co., who is also Chairman of the Mining Committee of the Los Angeles Chamber of Commerce.

Robert Mitchell, President, Consolidated Rock Products Co., and George W. Nilsson, Secretary, Mining Association of California, are Chairman and Vice-Chairman, respectively, of the Welcoming Committee.

Publicity Committee Chairman is Carl Miller, *Wall Street Journal*, and assisting him as Vice-Chairman is Edward Arthur, Mining Commissioner, Los Angeles Chamber of Commerce.

The Ladies' Hospitality Committee is headed by Mrs. Harvey S. Mudd, Beverly Hills, as Honorary Chairman, and Mrs. Harold J. Clark of Los Angeles as Chairman.

W. C. Lawson, General Manager, Phelps Dodge Corp., Douglas, Ariz., as Chairman of the Program Committee, will have the assistance of a committee composed of leading mining men from all producing areas of the country in developing a comprehensive program, which will feature an interchange of views among representatives of the industry, top Government officials and members of Congress on Federal policies affecting mineral production.

The discussions of mineral policy questions will share the spotlight with sessions devoted to the latest developments in operating methods and equipment in all phases of metal mining and industrial mineral production and treatment.

In addition to the Convention sessions, the concurrent Exposition will feature the greatest assembly of mining and mineral processing equipment ever held in the West. Exhibits will fill all three floors of the Shrine Exposition Hall and a large parking lot adjoining. The Exposition is sponsored by the Manufacturers Division of the American Mining Congress, under the chairmanship of Guy V. Woody, General Machinery Division, Allis-Chalmers Manufacturing Co.

Guy V. Woody

Special entertainment features will be provided, including two evening affairs and a number of daytime parties for the ladies. A noteworthy entertainment feature will be a tour of Walt Disney's famed Disneyland.

Mining Conference

The annual metal mining meeting sponsored by the Colorado Mining Association was held in Denver February 2-4, with a slate of excellent speakers, predominantly from the uranium industry. The lead, zinc, silver, strategic metals, fluorspar and oil shale industries also had messages to present. A lead-zinc proposal by Andrew Fletcher—see editorial on page 23—was of particular interest. W. Lunsford Long, president, Tungsten Mining Corp. talked on "Strategic and Critical Metals" and called for extension of the domestic minerals purchase program. "Silver Developments" were the subject of an address by E. O. Sowerwine, vice-president, Anaconda Co., in which he clearly analyzed the role of silver in monetary systems, denounced the present move to repeal existing silver legislation, and asked that bimetallism on a de facto basis be quickly reestablished.

A hard-hitting talk by Denison Kitchel, chairman of the A. M. C. Labor Committee, recommended legislation to remove the Federal Government from the bargaining table, to eliminate compulsory unionism in any form, and to prohibit the use of union funds for political action. Jesse C. Johnson, Director of the Raw Materials Division of the Atomic Energy Commission, traced developments in the atomic energy program; he demonstrated a sincere interest in the problems confronting the uranium mining industry but gave no indications as to extension of the existing ore-buying program.

Under Secretary Clarence A. Davis of the U. S. Department of the Interior spoke on "Government and Mining." He commended the accomplishments of the mining industry under the free enterprise system and cited the policies of the present Administration to preserve and foster that system. At an evening banquet session Simon Strauss, vice-president, American Smelting and Refining Co., called for an end to the present barter program of surplus agricultural commodities abroad for strategic metals and minerals. The final banquet of the meeting, the traditional "Sowbelly Dinner," was highlighted by a talk by Harold E. Stassen, representing the White House, in which he discussed "Uranium in a Peaceful World."

Kennecott Purchase

Kennecott Copper Corp. has announced the purchase of the Butterfield mines property of the combined Metals Reduction Co. Butterfield is located in the Oquirrh Range, south of the Bingham copper pit near Bingham, Utah. Approximately 3800 acres of lands were involved in the transaction.

After a geological reconnaissance, Kennecott may undertake exploration work at the property, which has been an important lead-zinc producer, a Kennecott official said.

Oregon Mercury

Mercury & Metals Corp. of San Francisco is planning to reactivate the Quicksilver Syndicate mine at Black Butte, Ore. It was reported that initial expenditures for exploration and preparation for production will be about $250,000. C. M. Schutte, San Francisco mining engineer, has been retained as consultant for the operation.

The property has been a ghost camp since the end of World War II. It is one of the oldest mines in the State, having been operated as early as 1890.

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AEC Buying Stations

Lucius Pitkin, Inc., New York, has taken over as contractor for the operation of AEC ore-buying stations on the Colorado Plateau and sampling laboratories at Grand Junction, Colo. Pitkin will retain Martin N. Gains as manager. Gains had served as manager for American Smelting & Refining Co., operator of the stations since 1948. Selection of Pitkin was made from eight active bidders on a cost-plus-fixed-fee type operational contract.

Silver Mountain Shaft

Hecla Mining Co. has started shaft-sinking operations at the Silver Mountain Lead Mines property. A 250-hp hoist has been installed and Washington Water Power Co. will supply electricity as soon as it completes a new substation for the operation.

The headframe and surface plant buildings for the Silver Mountain project were completed last fall upon a site at the mouth of Daisy Gulch, just north of the old Snowstorm mill foundation.

The project is a joint venture with Bunker Hill & Sullivan Mining & Concentrating Co., with Hecla as the operating company under a $1,058,366 Defense Minerals Exploration contract. It involves the sinking of a 2080-ft vertical shaft and some 6400 ft of lateral exploration, plus extensive diamond drilling from the bottom shaft level.

Silver Mountain Lead Mines, Inc., owns the property which consists of approximately 2000 acres on the north side of the Coeur d'Alene Valley, east and northeast of the Lucky Friday and Vindicator properties.

Idaho Strike Settled

The longest strike in the history of the Coeur d'Alene mining district of Idaho ended January 31 when Mine-Mill union members voted in favor of a new contract with the so-called "16 operators." The strike, involving approximately 900 men, started August 24. The union membership vote was 313 to 181 in favor of returning to work. The new contract calls for substantial wage increases retroactive to July 1, 1955, more liberal vacation provisions, and additional (seven) paid holidays, strengthened union security, weekly pay days, improved and broadened health and welfare benefits and recognition of union stewards.

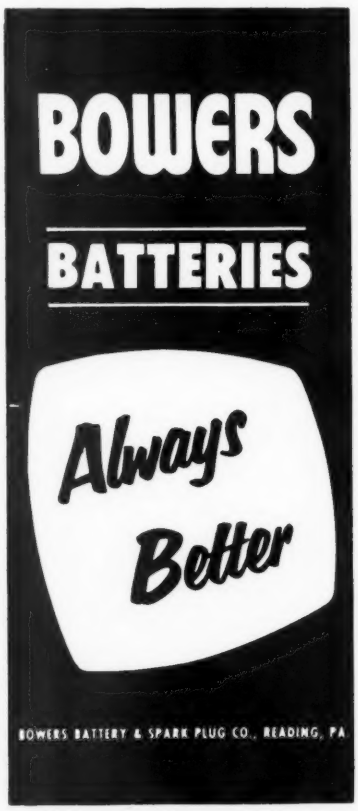
New wages call for $14.58 per day for surface and mill labor, $15.96 for miners, and as high as $18.62 for certain classifications of skilled work.

The new union security clause retains the previous maintenance of membership provision but eliminates the "escape period" during which employes could withdraw from the union. Under maintenance of membership, new employes are not required to join the union, but current union members cannot withdraw. The mine operator is now required to give new employes a copy of the union contract, an application for union membership, an application for union dues check-off and the address of the union hall, and to introduce new employes to the shop steward on the job during their first shift.

It is estimated that more than half of the striking workers found jobs in other mining districts, which will cause some delay for the properties to resume normal operations.

Salt Lake City Uranium

The City Commission of Salt Lake City has approved a five-year lease to C. L. Singleton, geologist, giving him the right to mine uranium on city-owned property. The city legal department set forth a royalty payment arrangement which provides for a graduated scale of royalties to the City on any marketable ore found. Under terms of the lease, the leasee must pay the city 12½ percent on ore valued at $30 or less per ton, and up to 35 percent on ore valued at $100 or more per ton. Singleton said he plans to start mining operations immediately.



To Test Mount Spokane District

Utahcan, Inc., of Spokane, Wash., will make a deep drill hole test in the Mount Spokane mining district according to E. M. Rasmussen, managing director and vice-president. The first deep tests in the Mount Spokane area are being made in the hope of finding the primary uranium ores pitchblend or uraninite beneath the surface showings of authunite. Rasmussen said the drilling rig is equipped to recover drill cores and is capable of drilling to depths of 3000 ft.

Lisbon Valley Copper

Continental Uranium, Inc., has acquired a 90-day option on the rights to mine and mill copper ore from claims held by the Atlas Uranium Corp. in the lower Lisbon Valley, Utah, according to Gerald Gidwitz, board chairman.

Atlas has done considerable drilling on the property and reports 300,000 tons of ore blocked out. The ore body runs southward into property held by Continental under lease from the State of Utah.

Mill flowsheet studies now under way will determine the type of milling procedure to be considered. Strip mining would be employed. The option provides that profits will be shared if the project proves economical.

Continental recently signed a contract with the Atomic Energy Commission for the construction of a uranium processing mill in nearby La Sal, Utah.

Sulphuric Acid Expansion

Garfield Chemical & Manufacturing Co., joint affiliate of American Smelting & Refining Co. and Kennecott Copper Corp., has started construction of a fifth unit at its contact sulphuric acid plant at Garfield, Utah. The new unit will boost daily output of 100 percent sulphuric acid from 750 tons to 1000 tons, it is reported.

South Dakota Maps

Four maps have been issued by the South Dakota State Geological Survey, adding a total of 2,530,600 tons of lignite to the estimated coal resources of that State. The maps are designated the Bison, Coal Springs, Chance and Meadow Quadrangles, forming a block in southeastern Perkins County. State geologist B. P. Rothrock reports that half of the coal area of the State has now been mapped and that the coal which can be recovered by strip mining has been appraised. The mapping has been carried on for three years.

The western half of the coal area has been almost entirely mapped and one more season should complete appraisal, Rothrock said. In addition to coal, the maps of western Perkins County and Harding County will show the known uranium deposits.

Utah Coal Resin

Combined Metals Reduction Co. has started reconstruction and improvements of its coal-resin plant at Bauer, Utah, according to E. H. Snyder, president. The new plants will replace those which were destroyed by fire in September 1955.

Meanwhile, the United States Fuel Co., subsidiary of the United States Smelting Refining & Mining Co., has announced that it would build a resin flotation plant at Hiawatha, Utah, to supply the new Bauer installation with its needs.

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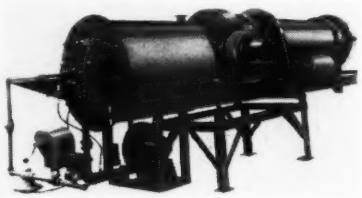
Manufacturers Forum

Rotary Dryers

Hardinge Co., Inc., 240 Arch St., York, Pa., has introduced a selection of self-contained pilot plant or laboratory size Ruggles-Coles Rotary Dryers. Available in three models, the



units are mounted on a structural steel frame and are easily portable.

Model XH-XF is a single shell, direct heat, gas fired dryer, which can be arranged for either parallel or counterflow operation.

Model XB is a double shell, indirect, gas fired rotary dryer, designed for high temperature drying without contaminations.

Model XC is a steam tube dryer for small capacity operations.

Geiger Counters

Atomic Research Corp., Colorado Springs, Colo., has announced the availability of Raytomic geiger counters. They are available with 1, 2, 3, 4, 6 or 10 nu-type bismuth geiger tubes.

Safety Goggles

A protective flexible plastic eyeshield said to have a fog-proof design is available from the United States Safety Service Co., 1215 McGee St., Kansas City 6, Mo. The company reports that by increasing the air circulation and reducing the area of air traps, cool, fog-free ventilation is achieved. In addition, they say, the goggle has been designed with the worker who wears prescription glasses in mind. The entire unit weighs less than two oz.

Masonry Protection

Vinyl coatings to prevent water damage to masonry construction are available from the Magic Chemical Co., 121 Crescent St., Brockton 2, Mass. The company reports that its Magic-Vulc No. 266 series of vinyl coatings will effectively waterproof seal cinder block, concrete block, stucco and brick.

One Man Drum Lift

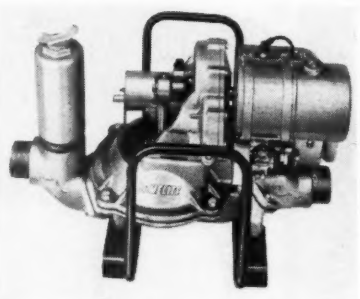
A drum lift which enables one man to handle 55 and 30-gal steel drums and 13-gal acid carboys has been announced by Sterling, Fleischman Co., Broomall, Pa. Drums may be raised for pouring to a height of 53 in. The lift has a 750-lb capacity.

Plastic Pipe

The Alloy Tube Division of the Carperten Steel Co., Union, N. J., is now marketing rigid unplasticized PVC (polyvinyl chloride) pipe. Two types are being offered—a normal impact grade with high chemical resistance, and a high impact grade with slightly less chemical resistance but greater strength. Threaded and socket types of fittings are available.

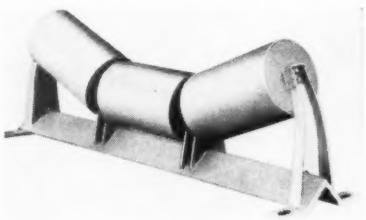
Diaphragm Pump

Homelite, 75 Riverdale Ave., Port Chester, N. Y., has announced a new heavy-duty diaphragm pump for handling up to 5000 gallons per hour of mud, muck, sand or sewage. Pump model 20DP3 weighs 120 lb and operates at engine speeds between 1500 and 2850 rpm. It is powered by a single-cylinder two-cycle gasoline engine, the speed of which can be adjusted for different pumping conditions.



Conveyor Idlers

A line of belt conveyor idlers has been announced by Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill. New from base to ball bearings, the idlers will be known as Link-Belt's series 50 and are available in both a greaseable type, with a "one shot" lubrication system serving all three rolls at once; and a factory sealed type, which requires no further greasing.



Series 50 belt conveyor idlers are available for seven belt widths from 14 in. to 36 in. Information on the complete line is contained in Folder 2516.

Easier to Read Slide Rule

A light-alloy slide rule made in green-yellow—eliminating violet and red rays which focus in front of and behind the retina has been introduced by Pickett & Eckel, Inc., 1109 S. Fremont, Alhambra, Calif. The company points out that the green-yellow shade coincides with optimum sight point of the spectrum, cuts eyestrain, blurring and errors in reading calibrations. They are now made in 6 in. and 10 in. Trig, Log-Log standard rules and are available in rules made to special order. A free catalog is available from the company upon request.

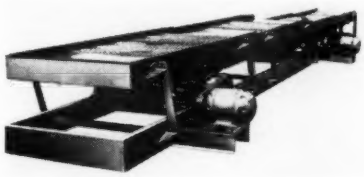
Fast Weighing Scale

Four exclusive features have been incorporated in a new line of Floaxial cabinet dial scales recently announced by the Fairbanks-Morse & Co., 600 So. Michigan Ave., Chicago, Ill. These are; a direct reading dial; a full swivel head; a cage-type central column construction; and a controlled-speed dash pot.

At the present time the scales are available in 36 models ranging in total chart capacity from 500 lb by ½-lb graduations to 120,000 lb by 20-lb graduations.

Balanced Screens

William & Green, Clearfield, Pa., have introduced a line of Balanced Screen Conveyors for screening or conveying. Designed for smooth, easy



operation without requiring rigid mounting installations, IMCO Screen Conveyors are available for screening from ⅛ in. up on coal, stone, ores, sand, gravel, etc. Built to operate from any existing power supply, the screens are available in standard sections.

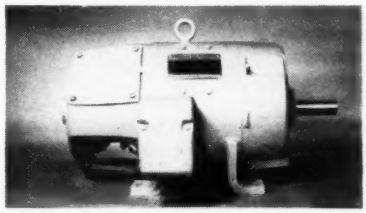
Hose Fittings

Two new products, a newly designed and engineered push-on fitting for low pressure use on machine tools or for shop air, water, fuel, or lubrication lines, and a special two-bolt clamp fitting for high pressure, heavy duty application for hydraulic lines, and steam hoses have been developed by Flex-O-Tube Division of Meridan Corp., 2525 Jim Daly Road, Inkster, Mich.

The push-on fitting is brass, comes in ¼, ⅜, and ½-in. sizes, and is designed for use with a P54 rubber-covered hose for a wide variety of low pressure uses up to 250 psi.

D-C Motors and Generators

General Electric Co., Schenectady 5, N. Y., has announced an entirely new line of direct-current motors and gen-



erators. Called the Kinamatic line it is built to the latest NEMA standards for future design. All motor ratings from one to 150 hp and all generators from ¾ to 100 kw are available. The motors may be used in either constant or adjustable speed applications. Speed may be adjusted by either armature voltage control, field strength control, or any combination of both. For constant horsepower applications, higher top speeds can be obtained through field strength adjustment.

Pattin Manufacturing Sold

Pattin Manufacturing Co. has been sold to the Eastern Malleable Iron Co. However, the company will be retained and there will be no change in the operating personnel nor in the established policies of the company.

Eastern Malleable has principal offices in Naugatuck, Conn. The Frazer M. Jones of Syracuse, N. Y., one of Eastern's five divisions, will continue to make Pattin Expansion Shells for Mine Roof Bolting. Officers of Pattin Manufacturing Co. are now J. B. Demsey, president; F. H. Shriver, vice-president; C. E. Brust, secretary and treasurer; and W. A. Kellar, assistant treasurer.

Head Protection

A cold weather helmet liner for outdoor workers is offered by the General Scientific Equipment Co., 27th and Huntingdon Sts., Philadelphia 32, Pa. Meant for occupations where per-

spiration readily soils the liner but warmth is required, the one-piece liner is made of a special twill fabric interwoven on the inside with warm fleece. The liner is cut "aviator style" to give maximum coverage of head and ears.

— *Announcements* —

John A. McGuire, vice-president of labor relations of **Thor Power Tool Co.**, Aurora, Ill., has been elected to a full vice-presidency of the company.

The appointment of **Lewis W. Greiner** to manager of safety of the Explosives Department of **Hercules Powder Co.** has been announced. Greiner succeeds **John T. Moore**, retired.

Pittsburgh Screw and Bolt Corp. has announced the appointment of **Howard R. Swartz** and **Frank L. Sonneman** as assistants to the president.

Austin Goodyear, vice-president and general manager of the industrial rubber, machinery and engineering divisions of **Hewitt-Robins Incorporated**, has been promoted to the position of executive vice-president of the company.

R. B. Warren has been named to succeed **H. D. Foster**, sales manager of the **Goodyear Tire & Rubber Company's** Industrial Products division, effective June 1, 1956. Foster will retire May 31 after 43 years of service with Goodyear.

O. A. Schilling, formerly Eastern sales manager for the company's Industrial Products division, replaces Warren as manager of Industrial Products Departments.

Appointment of **Clayton A. Landsidle** as executive vice-president of **Manu-Mine Research and Development Co.**, Reading, Pa., has been announced.

The appointment of **D. J. Clymer** as advertising manager of the **Detroit Diesel Engine Division of General Motors** has been announced.

Herbert Wignall has been named parts and service manager for **Link-Belt Speeder Corp.**

E. J. Mercer is appointed general manager, **Construction Machinery Division, Allis-Chalmers Mfg. Co.**, Milwaukee.

Wilmot Engineering Co., White Haven, Pa., has named **Marshall E. Prunty** a district sales manager for its Coal Preparation Equipment Division. Formerly associated with Roberts and Schaefer Co., he will cover the coal areas of West Virginia, Kentucky and Virginia from the Huntington, W. Va., office.

CATALOGS & BULLETINS

ALLIS-CHALMERS PRODUCTS. *Allis-Chalmers Manufacturing Co., 972 S. 70th St., Milwaukee, Wis.* A-C From A to Z is the theme of this 24-page directory of Allis-Chalmers' products. It includes an alphabetical description of company products and their descriptive literature.

BETHLEHEM SWITCH STANDS. *Bethlehem Steel Co., Bethlehem, Pa., or Bethlehem Pacific Coast Steel Corp., 20th and Illinois Sts., San Francisco 19, Calif.* Catalog No. 389 contains information on switch stands for standard and narrow gauge service.

CRUSHING PLANTS. *Denver Equipment Co., P. O. Box 5268, Denver 17, Colo.* Bulletin No. C12-B16 describes the company's Type "J" portable and semi-portable crushing plants. In addition, the smaller type "J" portable crushing unit and Denver Trailer crushers are also described.

GOODMAN ROPE BELT CONVEYOR. *Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago 9, Ill.* Catalog G-115 describes and outlines the operating advantages of Goodman's newly developed rope belt conveyor.

HAMILTON INDUSTRIAL RUBBER PRODUCTS. *Hamilton Rubber Mfg. Corp., Meade St., Trenton, N. J.* A 72-page catalog on the company's line on hose, belting, packing, molded and lathe-cut goods and mats. Information includes sizes, weights, applications, construction features and other material pertinent to product use. Requests should be made on company letterhead.

JEFFREY MINE FANS. *Jeffrey Mfg. Co., Columbus 16, Ohio.* Catalog 901 illustrates and describes the complete line of Jeffrey Ventilating Equipment. Fans from duties of 2 in. to 13 in. of water gauge are described as are blowers and exhausters.

S-A CONVEYOR BELT CARRIERS. *Stephens-Adamson Mfg. Co., Aurora, Ill.* Bulletin 355 describes company's line of standard Belt Conveyor Carriers and Trippers. In addition, a number of special carrier units are catalogued along with accessory equipment, such as guide rolls and special tripper spouts.

SKID-SHOVEL. *International Harvester Co., Consumer Relations Dept., 180 North Michigan Ave., Chicago 1, Ill.* Information describing the Hydro-Spring feature of the International Drott Skid-Shovel is contained in form CR-403-F. The Hydro-Spring feature, which acts as a shock cushion, is offered in four skid-shovel sizes ranging from one to three cubic yards, using International crawler tractors.

TRACK SPECIALTIES. *Ramapo Ajax Division, 155 North Wacker Drive, Chicago 6, Ill.* This well-illustrated 20-page booklet is a condensed catalog on track specialties for main line use as well as in quarries, mines, steel mills and other track work installations. Issued by the Ramapo Ajax Division of American Brake Shoe Co., it carries information on crossings, frogs, switch stands, lubricators, snow blowers, tie pads, tie plate anchor studs, and many other accessories.

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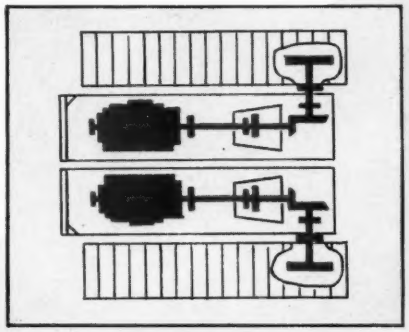
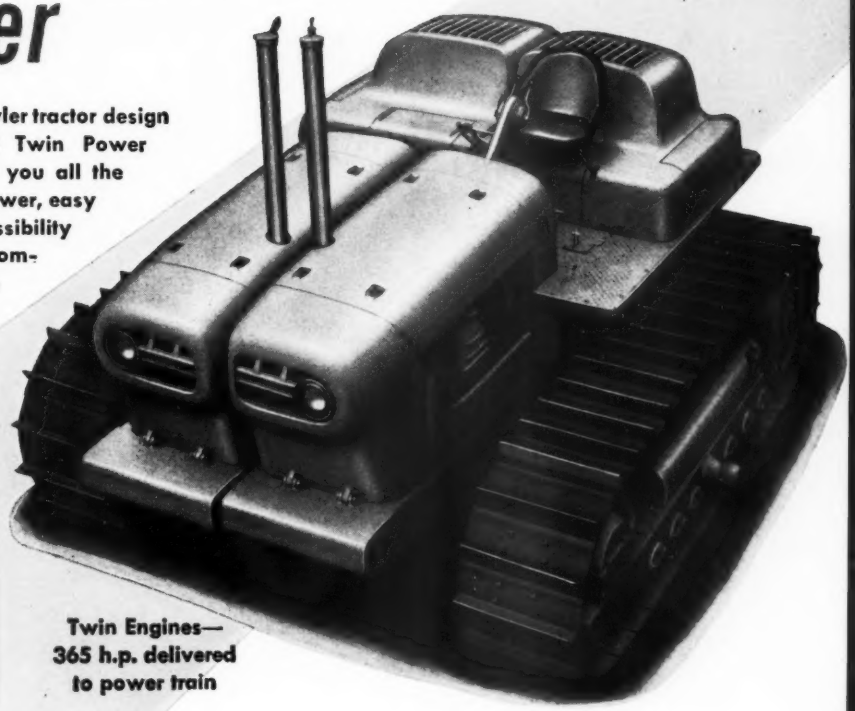
the "Euc" TC-12 Twin Crawler

Here's a completely new concept of crawler tractor design and performance . . . the new TC-12 Twin Power Euclid. It's designed and built to give you all the features you want in a tractor—more power, easy operation, greater workability and accessibility for servicing . . . and all power train components are matched, with years of application in earth moving equipment.





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SPECIFICATIONS

total h.p.—388 h.p. at rated speed	
available for tractive effort—365 h.p.	
speeds—3 speed ranges forward and reverse to 8.3 mph	
drawbar pull (bare tractor)—forward and reverse	54,000 lbs. low range 53,500 lbs. intermediate 53,000 lbs. high range
track width (standard shoe)	26"
track gauge	110"
overall width	11' 4"
overall length	16' 2"
height (excluding stacks)	7' 11"
drawbar height	23"
ground clearance	20"
operating weight (bare)	approx. 58,000 lbs.

Powered by two diesels with separate Torqmatic Drives for each track, the TC-12 has 365 h.p. available for tractive effort—a smooth steady flow of power to meet any job requirement. There's no master clutch and no manual gear shifting . . . the operator simply moves a lever to select one of three speed ranges—forward and reverse—for travel speeds up to 8.3 m.p.h. Maximum drawbar pull is equal to, or greater than, the weight of the tractor and any attachments.

Each half of the tractor is separate and free to oscillate on a single transverse shaft. This gives the TC-12 maximum stability and traction on rough ground. The tractor can be easily separated into two halves for shipment when necessary.

Never before so much workability!

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

EUCLID

Use the NEW M·S·A MinePhone

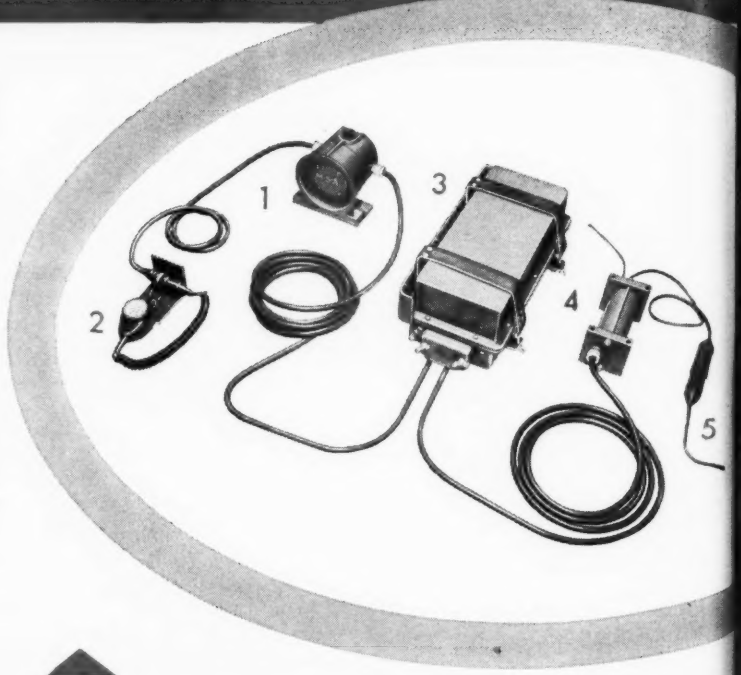
to BOOST the EFFICIENCY of your EXISTING HAULAGE SYSTEM

A growing number of mine operators, faced with the problem of increased production "out-running" existing haulage facilities, are finding an economical solution in M·S·A MinePhone installations.

This modern communication system, redesigned and greatly improved, permits operators to *safely* step-up present haulage operations to handle increasing tonnage output and offset major investments for new haulage equipment at the same time.

Because the M·S·A MinePhone provides clear, instant two-way voice communication, all haulage decisions are made quickly. The dispatcher is always in contact with motormen, maintenance repair shops, loading points. Motormen can reply while trips are in motion—trips keep on the move, waits on sidings are minimized. Repair needs are relayed quickly. Over-all safety is improved because one message alerts all personnel at once.

We will be happy to supply you with complete details. Write or call.



Here are the quality components of a single MinePhone Station

(1) HEAVY-DUTY SPEAKER—made of weather-resistant cast aluminum. Volume control built into housing. (2) PRESS-TO-TALK MICROPHONE—high quality transmission; molded neoprene case; Koiled Kord for safety. (3) RECEIVER-TRANSMITTER—single unit, compact. "Squelch" control maintains quiet when not in use, eliminates background noise. Dust-tight steel housing with mounting cradle for quick installation. (4) RESISTOR BOX—reduces trolley wire DC power to requirements for station. (5) IN-LINE POWER FUSE—combination power cut-off and fuse. Waterproof, dust-tight, molded neoprene case houses a 600 volt 3 amp. fuse. All parts built for rugged, long-life service.

SAFETY EQUIPMENT HEADQUARTERS

MSA

MINE SAFETY APPLIANCES COMPANY

201 North Braddock Avenue, Pittsburgh 8, Pa.

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Cable Address "MINSAF" Pittsburgh

When you have a Safety problem, M.S.A. is at your service.